Refinery Exchange Agreements: Pro-Competitive, Anti-Competitive or Benign?

Alistair Colin Davey

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Declaration

With the exception of the construction of data sets, as well as assistance with the description of the construction of those data sets, for monthly estimates of the Australian resident population and Australian per capita real income by Mr Christopher Roberts used in the estimation of an Australian unleaded petrol demand function contained in Appendix 1, all other work contained in this thesis is my own original work.

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Alistair Colin Davey

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Abstract

Refinery exchange agreements (REAs) are reciprocal trading agreements whereby an oil refiner agrees to supply petroleum products in areas of close proximity to their oil refinery to other oil refiners in exchange for the receipt of those same petroleum products in locations far removed from their refinery from those same oil refiners.

Views as to the competitive effects of REAs have been mixed. While some contend REAs are pro-competitive thus leading to reductions in supply costs that may eventually be passed on to consumers in the form of relatively lower retail petrol prices, others have argued they are anti-competitive and provide a means through which oil refiners can engage in tacit collusion in downstream markets.

This study identifies those conditions under which REAs are likely to exhibit an anti-competitive effect and will fill some of the gap in the literature by providing empirical testing as to the likely competitive effects of REAs in the Australian context through measuring their impact on capital city retail petrol prices as a proxy for their direct effect on capital city wholesale petrol markets. While the direct effect of REAs should be measured through their effect on wholesale prices, such wholesale price data is not generally available and it is contended that retail prices serve as an appropriate indicator for changes in the level of wholesale prices.

The null hypothesis that REAs have no effect on competition is tested against two alternative hypotheses: namely, REAs are either pro-competitive or anti-competitive. The hypothesis testing is conducted through testing for the average price effect, if any, on Australian capital city retail petrol prices arising from a *before* situation where REAs were in operation as compared to an *after* situation where they have been terminated. This is done through testing for structural change using exploratory data analysis and through modelling using Box-Jenkins autoregressive integrated moving average methodology coupled with Box and Tiao intervention analysis to quantify the impact of any structural change associated with the termination of REAs.

While capital city wholesale petrol markets are oligopolistic in nature and may be prone to sporadic outbursts of co-operation between rival firms, it was found they are also arguably competitive in that profits from reductions in production costs appear to be gradually competed away and eventually passed on to motoring consumers in the form of relatively lower retail petrol prices and as demonstrated by the inability of market participants to exercise market power on a prolonged or sustainable basis. The implications of this finding is that not only were various regulatory interventions doomed to failure because there was no apparent competition problem that needed to be rectified, but that it was highly unlikely REAs served as a facilitating device for tacit collusion under these circumstances.

It is further found that REAs generally lowered the costs of petrol supply which were passed on to motoring consumers in the form of relatively lower retail

petrol prices as evidenced by the rise in relative prices following the termination of REAs. REAs have been found to be benign at worst, but far more likely to be pro-competitive and efficiency enhancing, thereby leading to relatively lower retail petrol prices. On this basis, it would appear public policy is best served, provided that wholesale capital city petrol markets remain relatively competitive, to encourage the re-institution of REAs in Australia.

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Abbreviations

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACF	autocorrelation function
ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
AIP	Australian Institute of Petroleum
APADA	Australian Petroleum Agents and Distributors Association
ARCH	autoregressive conditional heteroscedasticity
ARIMA	autoregressive integrated moving average
BLUE	best linear unbiased estimator
BP	BP Australia Ltd
bpd	barrels per day
BOC	Bureau of Competition
CA	commission-agent
Caltex	Caltex Oil Australia Pty Ltd
Coles	Coles Myer Ltd
cpl	cents per litre
CRDW	Cointegrating Regression Durbin Watson
Dawson report	2003 report of the Trade Practices Act Review Committee
diesel	automotive distillate
Franchise Act	*Petroleum Retail Marketing Franchise Act 1980*
FCE	Fletcher Challenge Energy
FSGS	Fuel Sales Grant Scheme
FTC	Federal Trade Commission
GARCH	generalised autoregressive conditional heteroscedasticity
GST	goods and services tax
HAC	heteroscedasticity and autocorrelation consistent
ICRC	Independent Competition and Regulatory Commission
IEA	International Energy Agency
IPI	Import Parity Indicator
JVC	Joint Venture Company
Liberty	Liberty Oil
LM test	Lagrange multiplier test
LPG	liquid petroleum gas
ML	maximum likelihood
MCC	meeting competition clause
MMC	Monopolies and Mergers Commission (of the UK)
Mobil	Mobil Oil Australia Ltd / ExxonMobil Australia Pty Ltd
MOPS	Mean of Platts Singapore
MTAA	Motor Trade Association of Australia
MTBE	Methyl Tertiary Butyl Ether

NIM	notional industry margin
NRMA	National Road Motorists Association
OLS	ordinary least squares
OICPAC	Oil Industry Code of Practice Administration Committee
PACF	partial autocorrelation function
PJT	Prices Justification Tribunal
PMAA	Independent Petroleum Marketers Association of Australia
PP	Phillips-Perron
PPPA	Petroleum Products Pricing Authority
PSA	Prices Surveillance Authority
US	United States
RACV	Royal Automobile Club of Victoria
REAs	Refinery Exchange Agreements
RON	Research Octane Number
RTPC	Restrictive Trade Practices Commission (of Canada)
SC	Schwarz Criterion
Shell	The Shell Company of Australia Ltd
Sites Act	*Petroleum Retailing Marketing Sites Act 1980*
TGP	terminal gate price
TPA	*Trade Practices Act 1974*
TPC	Trade Practices Commission
Trafigura	Trafigura Fuels Australia
WC	week commencing
Wickland	Wickland Oil
Woolworths	Woolworths Limited

Chapter 1: Introduction

1.1 Introduction

Refinery exchange agreements (REAs) are reciprocal trading agreements whereby an oil refiner agrees to supply petroleum products in areas of close proximity to their oil refinery to other oil refiners in exchange for the receipt of those same petroleum products in locations far removed from their refinery from those same oil refiners. REAs have been a feature of the downstream petroleum industry in Australia, North America, Europe and Africa.

Views as to the competitive effects of REAs have been mixed. While some contend REAs are pro-competitive thus leading to reductions in supply costs that may eventually be passed on to consumers in the form of relatively lower retail fuel prices, others have argued they are anti-competitive and provide a means through which oil refiners can engage in tacit collusion in downstream markets. Even amongst some of those who maintain that REAs, on balance, are pro-competitive, there is an acknowledgement that they could be misused to serve an anti-competitive purpose.

While there are conflicting opinions as to the competitive effects of REAs, there has been no rigorous empirical testing and many of the conclusions that have been reached so far have been based on conjecture and supposition. Therefore, a gap exists in the literature given the lack of robust empirical testing on the competitive effects of REAs. The purpose of this study is to identify those conditions under which REAs are likely to exhibit an anti-competitive

effect and to fill some of the gap in the literature by providing empirical testing as to the likely competitive effects of REAs in the Australian context through measuring their impact on average capital city retail petrol prices as a proxy for their direct effect on capital city wholesale petrol markets.

1.2 Structure of the Thesis

This thesis has four parts:

1. Description of the downstream petroleum industry in Australia.

2. Review of the theoretical literature.

3. Testing and interpretation.

4. Conclusions.

1.2.1 An Outline of the Downstream Petroleum Industry in Australia

The first part contains one chapter, Chapter 2 entitled *Downstream Petroleum Industry in Australia*, which provides essential background and contextual information on the structure and operation of the downstream petroleum industry in Australia. It provides an examination of the characteristics of petrol as a product and describes the chain of production from the oil refinery to the motoring consumer. It also outlines the various regulatory interventions in petrol marketing in relation to market structure, price and taxation, as well as considers petrol pricing and competition issues. Chapter 2 will also provide information that will be used in the construction of data sets and modelling later on in the study.

1.2.2 Review of Theoretical Literature

The second part contains three chapters reviewing the theoretical literature relating to two key generic features relevant to the problem, namely market power and reciprocity, as well as reviewing the specific literature where these come together within REAs.

The exercise of market power is a major issue of contention for the Australian downstream petroleum industry. Chapter 3, entitled *Market Power*, will examine academic literature relevant to the exercise of market power within the downstream petroleum industry. During the period of this study the Australian downstream petroleum industry displayed a high degree of vertical separation between the retail and wholesale sectors coupled with some vertical restraints. Chapter 3 will examine the literature pertaining to vertical price relationships with a particular focus on the downstream petroleum industry and will draw conclusions that will provide the theoretical underpinnings for the hypothesis testing carried out later in the study. Above the retail sector, the Australian downstream petroleum industry could be characterised as an oligopoly in that there are relatively few sellers. Chapter 3 will also review the theoretical literature pertaining to oligopoly and focus on the problems posed by the interdependency of market participants. It will identify those conditions as likely to be conducive for rival firms to behave in a co-operative manner towards one another, thus leading to tacit collusion and an anti-competitive outcome.

REAs are an example of reciprocal trading agreements. Chapter 4, entitled *Reciprocity*, examines and critically reviews the theoretical literature pertaining to the competitive effects of reciprocity. It assesses the conditions under which reciprocity is likely to be pro-competitive and/or anti-competitive in order to draw out the possible implications for the competitive effects of REAs.

Chapter 5, entitled *Refinery Exchange Agreements*, examines and critically reviews the literature pertaining to the competitive effects of REAs. It assesses the various rationales put forward as to why REAs are either pro-competitive or anti-competitive and deduces whether they are robust or not.

1.2.3 Testing and Interpretation

The third part of this study consists of two chapters providing empirical testing of the hypotheses and the interpretation of the results.

Chapter 6, entitled *Statistical Analysis and Modelling of REAs*, tests the null hypothesis that REAs have no effect on competition against two alternative hypotheses: namely, that REAs are either pro-competitive or anti-competitive. The hypothesis testing is conducted through testing for the price effect, if any, on average Australian capital city retail petrol prices arising from a *before* situation where REAs were in operation as compared to an *after* situation where they have been terminated as a proxy for the direct effect of REAs within wholesale markets. While the direct effect of REAs should be measured through their effect on wholesale prices, such wholesale price data is not generally available and it is contended that retail prices serve as an appropriate

indicator for changes in the level of wholesale prices. The hypothesis testing will be conducted in two parts. In the first part, a comparison is made of *before* and *after* situations through testing for structural change using exploratory data analysis. In the second part, modelling is conducted using Box-Jenkins autoregressive integrated moving average methodology coupled with Box and Tiao intervention analysis in order to quantify the impact of any structural change associated with the termination of REAs.

Chapter 7, entitled *Interpretation*, interprets the results of the modelling conducted in Chapter 6. Chapter 7 makes observations regarding the pattern and nature of competition within the capital city wholesale petrol markets considered as well as interprets the impact of certain events and various regulatory interventions. Finally, Chapter 7 makes findings on the likely competitive effects that REAs have had on the various capital city wholesale petrol markets considered.

1.2.4 Conclusions

The fourth part contains Chapter 8 entitled *Conclusion*, which draws out the main implications for the conduct of public policy in relation to the downstream petroleum industry. It considers the implications of further regulatory intervention in capital city wholesale petrol markets. It also considers the competitive effects of reciprocity as practised through REAs and their implications for the structure of competition law in Australia. Further, it examines the role played by the Australian competition law enforcement authority in the public debate over the competitive effects of REAs and

determines whether such conduct was appropriate. Finally, it makes recommendations on the future direction of public policy in relation to REAs.

Chapter 2: Downstream Petroleum Industry in Australia

2.1 Introduction

This Chapter provides background information on the structure and operation of the downstream petroleum industry in Australia. It examines the characteristics of petrol as a product and describes the chain of production from the oil refinery to the motoring consumer. It also outlines the various regulatory interventions in petrol marketing in relation to market structure, price and taxation, as well as considers petrol pricing and competition issues.

This Chapter will demonstrate that petrol is a homogeneous product and that price is the main dimension upon which participants compete in the Australian downstream petroleum industry. This will provide the basis for the method that will be used for the empirical testing conducted in Chapter 6 as to the competitive effects of REAs. This Chapter will also outline information that will be used in the construction of data sets and modelling in Chapter 6.

This Chapter will also demonstrate that competition and pricing practices are a major concern for the Australian downstream petroleum industry.

2.2 Petrol

This study will focus on the wholesaling and retailing of unleaded petrol.[1] Petrol is not a product that is purchased as an end in itself, but as an

[1] Also known as unleaded motor spirit and referred to as gasoline overseas.

essential input in providing motor vehicle transportation.[2] While there are substitute products available for petrol, such as liquid petroleum gas (LPG) and automotive distillate (diesel), any vehicles using these substitute products either have to be purchased with engines compatible with these fuels or have to be converted over so that they can operate on such fuels.

Petrol is a product that is generally considered to be inelastic with regard to price in that the quantity demanded responds less than proportionately to changes in price. A demand function for unleaded petrol estimated for Australia between May 1998 and September 2006 based on monthly data as part of this study suggests that the short-term price elasticity of demand is extremely low at around -0.12, while the long-run price elasticity of demand is somewhat higher at -0.38. In other words, the price elasticity of petrol increases over time as consumers are able to respond to price incentives presented to them over a sustained period through possibly improvements in technology related to passenger motor vehicles and/or changes in behaviour. Full details on the demand function for unleaded petrol estimated for Australia is provided in Appendix 1.

In the 2005-06 financial year, 19,048 megalitres of petrol was consumed in Australia. The recent Australian consumption of petrol on a financial year basis is provided in table 1 below.

[2] Lowe, J. F. (1976) Competition in the U.K. Retail Petrol Market 1960-73. *The Journal of Industrial Economics* XXIV, 203-219, p. 204.

Table 1: Australian Consumption of Petrol

Financial Year	Petrol Consumption in Megalitres*
1997-98	17,950
1998-99	18,230
1999-00	18,477
2000-01	18,168
2001-02	18,669
2002-03	18,872
2003-04	19,962
2004-05	19,876
2005-06	19,048

Source: Australian Bureau of Agricultural and Resource Economics (2005) *Australian Commodity Statistics 2005*. Canberra; Australian Bureau of Agricultural and Resource Economics (2006) *Australian Commodity Statistics 2006*. Canberra.
* Figures include unleaded petrol, petrol containing lead, and lead replacement petrol.

The upstream petroleum industry refers to activities involved in the exploration and production of crude oil, whereas the downstream petroleum industry refers to the production chain process whereby crude oil is converted into products that are eventually supplied to motoring consumers. The downstream petroleum industry can be separated into three functional levels: refining; distribution and wholesale; and retailing. Each of the downstream petroleum industry's functional levels will be outlined in turn.

2.3 Oil Refining

2.3.1 The Refining Process

Crude oil is an amalgam of many different types of hydrocarbons. Hydrocarbons are molecules that contain hydrogen and carbon that come in various different lengths and structures; they are useful molecules because they contain a lot of energy.

The refining of crude oil involves the separation of crude oil into different categories of hydrocarbons, also known as fractions. Therefore, oil refining is a joint production process whereby several products are manufactured simultaneously. The products manufactured during the refining process

include petrol, diesel, aviation turbine fuel, fuel oil, and a number of other derivative products.

Different hydrocarbons have different boiling points which allows crude oil to be separated into different fractions through distillation. The primary refining process commences when crude oil is heated under vacuum conditions until it evaporates whereby the vapour flows into a distillation tower where it condenses in various stages, with the most volatile or lighter fractions condensing at the top, intermediate fractions condensing at lower levels, and the heaviest fractions settling near the bottom.[3] In order to increase the yield of higher value products such as petrol from a given quantity of crude oil, further chemical processing of other fractions is required. The greater a refinery's yield of petrol and other higher value added products is, the greater will be the refinery's capital costs.

There are three main chemical processes used in Australia through which refineries are able to increase their yield of petrol. One process is known as naphtha reforming (also known as unification), whereby the smaller hydrocarbons contained in naphtha are combined in the presence of a catalyst in order to produce the larger hydrocarbons of petrol.

Another process, which is known as fluid catalytic cracking, is where the larger hydrocarbons of gas oil are heated in the presence of a catalyst and broken down into smaller hydrocarbons such as diesel and petrol. Similar to fluid catalytic cracking, hydrocracking heats heavy oil in the presence of a catalyst and hydrogen gas to convert it into petrol and kerosene.

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[3] Scherer, F. M. (1996) *Industry Structure, Strategy, and Public Policy*. HarperCollins College Publishers, New York, p. 113.

In order to remove impurities from the various fractions, such as sulphur, further chemical processing must be undertaken that adds to a refinery's capital costs. In order to remove more impurities further capital investment in Australian refineries was made necessary by the Commonwealth Government's clean fuel agenda that introduced new fuel standards for petrol and diesel, the first part of which was announced in July 2001 and the second part announced in July 2004. These standards will be introduced progressively between 2002 and 2009. It is estimated that an investment of more than $2 billion in capital upgrades will be necessary in order for Australian refineries to comply with these new fuel standards.[4]

2.3.2 Refining in Australia

Within the time period under consideration in this study there were eight major oil refineries operating within the vicinity of five capital cities run by four refining companies being Caltex Oil Australia Pty Ltd (Caltex), BP Australia Ltd (BP), Mobil Oil Australia Ltd (Mobil), and The Shell Company of Australia Ltd (Shell). With the exception of Caltex, the other three oil refiners are wholly owned subsidiaries of multinational oil companies: the United Kingdom based BP PLC; the United States (US) based ExxonMobil Corporation; and the Anglo-Dutch Royal Dutch Shell Group. Caltex is an Australian public company that is listed on the Australian Stock Exchange with a 50 per cent interest ultimately held by US based multinational oil company ChevronTexaco Corporation. The four Australian oil refiners are fully vertically integrated downstream, also operating in distribution and wholesale, and retailing sectors. The four

[4] Campbell, I. (2005) Massive Investment in clean diesel for WA. *Media Release*, Australian Minister for the Environment and Heritage, 2 September.

vertically integrated refiners are collectively referred to as the *oil majors* and are also known as the refiner/marketers.

Oil refining in Australia has undergone significant rationalisation and has become more heavily concentrated since 1980, which has led to eight refining companies operating ten refineries contract down to four refining companies operating seven refineries (an eighth refinery in Port Stanvac was mothballed in 2003).[5] In 1982, French refining company Total exited Australia, selling its refining and distribution assets to Ampol. In 1984, Ampol closed down the former Total refinery located at Matraville in Sydney. In 1984, BP acquired the Bulwer Island refinery in Brisbane from US refining company Amoco along with its distribution and retailing assets. In 1985, BP closed its Westernport refinery near Melbourne. In 1990, Mobil acquired the downstream assets of Esso (a subsidiary company of US refining company Exxon), and took ownership of the remaining 35 per cent interest in the Port Stanvac and Altona refineries that it didn't already own. In 1995 Ampol and Caltex reached an agreement to merge the two companies.

The ownership, location, and primary production capacity of the eight refineries operating in Australia between 1997 and 2003 are outlined in table 2 below.

[5] It could be argued that Australia had a ninth refiner in H. C. Sleigh who marketed themselves under the Golden Fleece banner. While H C Sleigh did not refine petrol as such, it did own a 25 per cent stake in the Kurnell lubricating oil refinery in 1980 that was majority owned by Caltex. In 1981, H. C. Sleigh sold its petroleum interests to Caltex.

Table 2: Ownership, Location and Primary Production Capacity of Australian Refineries 2003

Oil Major	Location	Production Capacity in Barrels Per Day (bpd)
Ampol/Caltex	Lytton (Brisbane) Kurnell (Sydney)	105,500 124,500
BP	Bulwer Island (Brisbane) Kwinana (near Perth)	88,000 138,500
Mobil	Altona (Melbourne) Port Stanvac (near Adelaide)	135,000 78,000
Shell	Clyde (Sydney) Geelong (near Melbourne)	86,000 119,000

Source: Australian Institute of Petroleum (2003) *Downstream Petroleum 2003.* Canberra, p. 5.

Australian refineries are considered to be relatively small by world standards with eight refineries having a total production capacity of 874,500 barrels per day (bpd). By way of comparison in Singapore, which is the major refining centre closest to Australia, there are three major oil refineries that have a total production capacity of 1.3 million bpd: ExxonMobil's 605,000 bpd refinery; Royal Dutch Shell's 458,000 bpd refinery; and the Singapore Refining Corporation's 273,000 bpd refinery.[6]

The Australian refinery industry has been built around supplying virtually all domestic demand through a nationwide network of fuel distribution and retailing, with the exception of the Northern Territory which usually has product imported in from Singapore.[7] Australian production of petrol is provided in table 3 below.

[6] Energy Information Administration, United States Department of Energy (2005) *Singapore Country Analysis Brief.* Washington DC. http://www.eia.doe.gov/emeu/cabs /singapor.html [Accessed 16 February 2006]

[7] Department of Industry, Tourism, and Resources (2002) *Downstream Petroleum Industry Framework 2002.* Canberra, p. 5.

Table 3: Australian Production of Petrol

Financial Year	Petrol Production in Megalitres*
1997-98	18,589
1998-99	18,705
1999-00	18,652
2000-01	17,887
2001-02	18,000
2002-03	17,984
2003-04	17,375
2004-05	17,913
2005-06	16,528

Source: Australian Bureau of Agricultural and Resource Economics (2005) *Australian Commodity Statistics 2005*. Canberra; Australian Bureau of Agricultural and Resource Economics (2006) *Australian Commodity Statistics 2006*. Canberra.
* Figures include unleaded petrol, petrol containing lead, and lead replacement petrol.

All eight Australian oil refineries possessed distillation and naphtha reforming capacity. The only oil refinery without the capacity to undertake fluid catalytic cracking was Port Stanvac, while the only refinery with the capacity to undertake hydrocracking was Bulwer Island.

Oil refining is subject to large economies of scale (as well as scope) as capital costs rise less than proportionately with capacity.[8] Scherer has estimated that refineries need a production capacity of 200,000 bpd in order to reach the minimum efficient scale.[9]

According to the Australian Competition and Consumer Commission (ACCC), the relatively small size of domestic demand for petroleum products combined with the need to achieve economies of scale in production, assist to explain the high level of concentration in the Australian refining sector.[10]

[8] Australian Competition and Consumer Commission (1996) *Inquiry into the Petroleum Products Declaration*. Vol. 1, Main Report, AGPS, Canberra, p. 8.
[9] Scherer, F. M., *op.cit.*, p. 114.
[10] Australian Competition and Consumer Commission, *op.cit.*, p. 8.

In April 2003, Mobil announced that it would be ceasing operations at its Port Stanvac refinery and would mothball the refinery. Mobil attributed the closure to the fact that the refinery was incurring financial losses on its operations and that it couldn't compete against larger refineries in the Asia Pacific region.[11] The production of petrol and other fuels at the Port Stanvac refinery ceased in early June 2003.[12]

2.4 Distribution and Wholesale

Petrol in Australia is either sourced from domestic refining operations of the oil majors or from imports.

2.4.1 Distribution and Wholesale by the Oil Majors

The oil majors operate wholly owned wholesale or distribution companies separate from their refining operations through which they distribute product to petroleum retailers. The distribution companies of the oil majors typically supply their own branded retail service station site network as well as other customers in the major metropolitan areas.

Traditionally, the oil majors used to gain access to petrol supply in states where they did not possess a refinery through REAs. REAs were negotiated on a six month basis whereby product was exchanged between oil majors on a litre-for-litre basis. Under the refinery exchange agreement system, an oil major could be supplied in a location remote from their refinery network at essentially their own cost of production without incurring the significant cost of transporting petrol from their own refinery.

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[11] Mobil Oil Australia Pty Ltd (2003) Adelaide Refinery. *Media Release*, 8 April.
[12] Byers, D. W. (2003) Letter to the Editor. *The Advertiser*, Public Affairs Manager, Mobil Oil Australia, 14 August: 17.

From 1 January 2000, REAs in respect of the Mobil Port Stanvac refinery located near Adelaide were terminated.[13] Prior to 2000, Mobil had entered into REAs with each of the other three domestic refiners in regard to the Port Stanvac refinery.

According to Mobil, the company had sought to change its refinery exchange arrangements from a volume-for-volume basis to a buy-sell arrangement under an established price.[14] Mobil contended that this new arrangement would have more appropriately reflected the Port Stanvac refinery's cost structure.[15]

Shell and BP rejected Mobil's revised agreement offer in regard to Port Stanvac "because [product] was being offered at a higher price than the rate at which they could ship in their own product from interstate".[16] A Shell company spokesperson commented on the revised Mobil offer for a refinery exchange agreement for the Port Stanvac refinery that:

> If an oil company can ship its product in for less than Mobil are offering theirs for, you have to wonder just how competitive it was and why we would buy it off them. It was Mobil that terminated the normal industry refinery exchange of fuels between states and oil companies.[17]

This decision by Mobil resulted in two of the other three domestic refiners in Shell and BP deciding to source their product needs for Adelaide from

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[13] *The Australian Financial Review* (1999) Government throws refiners a lifeline. 3 December: 58; *The Australian Financial Review* (1999) Mobil to halve Port Stanvac Production. 30 December: 3.
[14] *Platts Oilgram News* (2000) Mobil Australia to Slice Runs After Swaps Dispute. 3 January: 1.
[15] *ibid.*
[16] *The Advertiser* (2000) Oil Change. 4 March: 61.
[17] *ibid.*

their refineries located interstate. In the case of BP from the Kwinana refinery, and in Shell's case from their Geelong refinery. Only Caltex decided to continue supply arrangements with Mobil from the Port Stanvac refinery. In the aftermath of the breakdown of REAs in regard to the Port Stanvac refinery, Mobil cut its production at the Port Stanvac refinery back to 60 per cent of capacity.[18]

The termination of REAs in regard to the Port Stanvac refinery had a minimal impact on the operation of REAs in the other capital cities. It is reported that Mobil replaced its lost volumes in New South Wales with the 10 per cent of production normally exported overseas from its Altona refinery in Melbourne, while Mobil intended to seek product supply in Western Australia through imports.[19]

The termination of REAs across Australia was prompted by the decision of BP to inform the other three domestic refiners that it was withdrawing from existing REAs as from 1 July 2002. The refinery exchange system was replaced with transactions occurring on purely commercial terms, known as *buy-sell* arrangements. Similar to REAs, buy-sell arrangements are commercially negotiated every six months on a bilateral arms-length basis between each of the oil majors.[20] The *sell* part of the buy-sell arrangements is relevant to states where the oil majors have refineries and sell to other oil

[18] *Oil & Gas Journal* (2000) Industry Briefs. 17 January: 27; *Reuters Wire Service* (2000) Diary – Asian Oil Refinery Maintenance 2000. 28 June.
[19] *Platts Oilgram News*, *op.cit.*, p. 1.
[20] Caltex Australia Limited (2006) *Caltex submission to Senate Economics Legislation Committee Inquiry into the Price of Petrol in Australia.* Sydney, p. 8.

majors; the *buy* part is relevant where the oil majors have no refineries and must purchase from local refiners.[21]

The abandonment of the refinery exchange agreement system was preceded by the departure from producing uniform grades of petrol across all states.[22] Product standards for petrol were legislated in Western Australia, Queensland, and South Australia which exceeded the then Australian standard which were related to the output capabilities of the refineries operating in those respective states.[23]

Similar to REAs, the oil majors also used to operate borrow and loan arrangements which involved the provision of product from another refiner's storage over a shorter term than REAs.[24] The ACCC identified three types of borrow and loan arrangements:

- *Permanent* where a refiner possessed no facilities in a region but obtained ongoing drawing rights from another refiner's tanks;

- *Temporary* where a refiner had storage facilities but due to maintenance programs or structural changes, experienced shortages; and

- *Emergency* or *spot* when there were unforeseen interruptions or shortfalls in supply.[25]

According to the Commonwealth Government Department of Industry, Tourism and Resources, borrow and loan arrangements supported the

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[21] *ibid.*, p. 8.
[22] Consumer Affairs Victoria (2003) *Report on Terminal Gate Pricing in Victoria.* Melbourne, p. 11.
[23] *ibid.*, p. 11.
[24] Australian Competition and Consumer Commission, *op.cit.*, p. xiii.
[25] *ibid.*, p. 24.

refinery exchange agreement system through evening out any imbalances that occurred in the exchanges over time.[26]

In regional areas the oil majors often supply petroleum products through distributors who are the primary source of petrol supply to retailers outside of the metropolitan area. It is estimated that distributors are responsible for some 85 per cent of total petroleum product sales in country areas.[27] Distributors typically operate a central storage depot with satellite depots and a fleet of tanker trucks.[28] It was estimated there were 140 distributors operating in Australia in June 2003, down from approximately 300 in 1998.[29]

There are sometimes formal vertical linkages between oil majors and distributors, with oil majors often maintaining an equity interest in a distributor or entering into a franchise agreement with a distributor. In addition, there are independent distributors who may source product from the oil majors on either a term/volume supply arrangement or on a spot sale basis.[30]

The oil majors occasionally require imports in order to supplement their refinery production during periods of refinery maintenance and shutdown.[31] The oil majors operate import terminals around the Australian mainland as well as in Tasmania.

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[26] Department of Industry, Tourism, and Resources, *op.cit.*, p. 22.
[27] Australian Petroleum Agents and Distributors Association. Membership Profile. http://www.apada.com.au/index.html [Accessed 26 March 2006]
[28] Department of Industry, Tourism, and Resources, *op.cit.*, p. 7.
[29] *ibid.*, p. 7.
[30] Walker, J. and Woodward, L. (1996) The Ampol /Caltex Australia Merger: Trade Practices Issues. *Trade Practices Law Journal* 4, March, 21-44, p. 24.
[31] Department of Industry, Tourism, and Resources, *op.cit.*, p. 7.

The oil majors have also entered into a number of bilateral and multilateral terminal sharing arrangements between each other around Australia. Joint terminalling arrangements between the oil majors have enabled them to lower their fuel distribution costs through the sharing of both capital and operating costs.[32]

2.4.2 Distribution and Wholesaling by Independents

The term *independent* is generally used to refer to market participants that are not vertically integrated all the way from refining into retailing. In other words, any market participants who are not oil majors.

Petroleum products have been imported into Australia by independent importers. There are four terminal facilities within the vicinity of Australian capital cities that are available for the independent import of petrol. Details of the operator, location, and storage capacity of these independent terminal facilities is provided below in table 4.

Table 4: Independent Import Terminals

Operator and Location	Tank Capacity (megalitres in 000's)	Maximum Import Cargo Size
Van Ommeren / VOPAK Port Botany Sydney	100 (76 available for petrol)	80
Wickland / Van Ommeren / VOPAK / Trafigura Hastings Point (near Melbourne)	70 (60 available for petrol)	30
Terminals West (Gull Petroleum) Kwinana (near Perth)	58 (53 available for petrol)	30
Fletcher Challenge / Neumann Petroleum Brisbane	43 (13 available for petrol)	15

Source: Department of Industry, Science, and Resources (1999) *Downstream Petroleum Products Action Agenda.* Canberra, p. 30.

[32] Australian Competition and Consumer Commission, *op.cit.*, p. 26.

In 1995, Dutch company Van Ommeren commenced work on constructing a petroleum products storage facility in Sydney on Botany Bay. The Sydney independent import terminal was opened in September 1996. Ownership of the Sydney independent terminal was transferred to VOPAK following the merger between Dutch companies Royal Pakhoed and Royal Van Ommeren (the parent company of Van Ommeren) to form VOPAK in March 1998.

The independent import terminal at Hastings near Melbourne was bought by US company Wickland Oil (Wickland) from Australian interests in 1995. In April 1997, Van Ommeren reached an agreement with Wickland to acquire the Hastings terminal. In mid-2001, VOPAK sold the Hastings terminal to Trafigura Fuels Australia (Trafigura).

The independent import terminal in Brisbane was previously owned by Caltex but was sold to New Zealand conglomerate Fletcher Challenge Energy (FCE) in 1996 as part of the undertakings provided to the Trade Practices Commission (TPC) for allowing the 1995 merger between Ampol and Caltex to proceed.[33] The Neumann Petroleum Group purchased the Brisbane independent import terminal from Rubicon, a company formed from a spin-off of FCE, in June 2001.

In Western Australia, Terminals West is a fully owned subsidiary of Gull Petroleum. Despite owning a terminal, Western Australia's restrictive fuel specifications have precluded Gull Petroleum from importing petrol since

[33] The Trade Practices Commission was the predecessor organisation to the Australian Competition and Consumer Commission as Australia's competition law enforcement agency.

the beginning of 2000 and it sources product from BP's Kwinana refinery for its wholesaling operations.

There have been several major independent wholesalers operating around mainland Australia.

On the east coast of Australia, Burmah Fuels previously operated a major wholesaling business, importing fuel from overseas through the Sydney and Hastings independent import terminal to supply the Sydney and Melbourne wholesale markets. The Burmah Fuels wholesaling operation was sold to Trafigura in May 2000.

Trafigura used the independent import terminals in Sydney and Hastings in order to import petrol from overseas to supply the Sydney and Melbourne wholesale markets. Trafigura supplied Woolworths Limited (Woolworths) in New South Wales and Victoria and was a partial supplier to convenience store operator 7-Eleven.

Under the Commonwealth Government's fuel standards announced in July 2001, the levels of methyl tertiary butyl ether (MTBE) and olefins allowed in petrol were limited as from 1 January 2004. The level of MTBE allowed in petrol was limited to 1 per cent by volume, while the level of olefins was limited to an 18 per cent six month pool average with an absolute cap of 20 per cent. The imposition of these new fuel standards made the business of importing petrol from overseas more difficult as while Australian refineries did not use MTBE, it was commonly used in Asian refineries.

The ACCC noted in August 2004, that concern over access to fuel supplies arising from the introduction of tighter fuel standards by state and Commonwealth governments had a noted impact on the business of independent importers. Major independent retail chains changed their supply arrangements and sought longer term contracts with domestic refiners in order to ensure security of supply, thus making independent imports less viable.[34]

With the implementation of new fuel standards, Trafigura lost Woolworths as a customer as Woolworths sought improved security of supply through entering into a joint venture with Australian refiner Caltex. However, Trafigura continues to wholesale petrol and other petroleum products along the Australian eastern seaboard, supplying product from terminals in New South Wales, Victoria, Queensland, and South Australia, although it lost its lease to use the independent import terminal in Sydney at the end of August 2004.

Liberty Oil (Liberty) continues to wholesale petrol to retailers in all states and territories despite withdrawing from petrol retailing. United Petroleum wholesales petrol to retailers in New South Wales, Victoria, South Australia, Queensland, and the Australian Capital Territory. Neumann Petroleum and Matilda Fuels wholesales petrol to retailers in the south east corner of Queensland and northern New South Wales.

[34] Australian Competition and Consumer Commission (2004) No ACCC action over Vopak Port Botany lease. *Media Release*, 24 August.

2.5 Retailing

2.5.1 Categories of Retailers

Since 1970, the number of retail service station outlets has been in steady decline. In 1970, there were 20,000 retail service station outlets in Australia; by 2004, there were an estimated 6,649 retail service station outlets.

There are several different types of retail service station outlets operating in Australia:

- Company operated sites, whereby the site is directly operated by company employees.

- Commission-agent (CA) sites are owned and operated by oil majors and independent chains. CA sites sell branded petrol at a price set by their fuel supplier and the operator will usually receive a fixed commission on petrol sales.[35]

- Franchise sites, whereby the franchisee has a formal contractual arrangement with the franchisor, usually being either an oil major or an independent, generally purchasing fuel at a wholesale price. The majority of sites owned by the oil majors during the period of this study were primarily operated through franchise arrangements. While franchise agreements were originally negotiated with an individual on a single site basis, there has been a shift to franchisees covering a number of sites which is known as multi-site franchising.[36]

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[35] Department of Industry, Tourism, and Resources, *op.cit.*, p. 8.
[36] Australian Competition and Consumer Commission (2001) *Reducing Fuel Price Variability*. Canberra, p. 37.

- Dealer-owned sites, whereby the operator usually enters into an agreement with a supplier to carry a supplier's brand although they can also be unbranded. Suppliers to such sites can be either oil majors or independent wholesalers.

- Distributor sites, whereby petroleum product distributors own and operate retail service station sites. These sites are more common in country areas and may carry the branding of an oil major, own branding, or no branding.[37]

- Supermarket sites, whereby supermarket chains have entered into petrol retailing.

Table 5 below provides a breakdown over time of the number of retail service station sites operating in Australia.

Table 5: Estimate of the Number of Retail Service Station Sites

Type of Service Station	1993	1998	2000	2004
Oil Major Company operated or Commission Agent	299	316	296	316
Oil Major Franchisee	3618	2497	2019	958
Other - Oil Major Branded	4899	4856	5047	3895
Independent Chains	267	479	659	608
Supermarkets	-	85	156	872

Sources: Industry Commission (1994) *Petroleum Products.* AGPS, Melbourne, Report No.40, p. 9; Senate Economics Committee (2001) *Inquiry into the provisions of the Fair Prices for All (Petroleum) Bill 1999 and the practice of multi-site franchising by oil companies.* Canberra, p. 10; Australia Institute of Petroleum (2006) *Submission to the Inquiry into Future Oil Supply and Alternate Transport Fuels.* Canberra, p. 18.

[37] Department of Industry, Tourism, and Resources, *op.cit.*, p. 9.

2.5.2 Retail Networks of the Oil Majors and Independents

The four oil majors dominate the retailing of petrol in Australia. It is estimated that around 90 per cent of retail service station sites in Australia at the end of 2000 were part of the branded network of the oil majors. The franchisees of the oil majors have tied supply arrangements whereby they are required to purchase all of their fuel from their oil major franchisor.

Independent retailers and retail chains refer to retail market participants that are not vertically integrated all the way back to the refining stage.

Independent chains such as Burmah Fuels, Liberty, Gull Petroleum, Neumann Petroleum and Matilda Fuels, have mainly operated retail service station sites located in capital cities and larger regional towns.

Burmah Fuels operated a network of around 120 retail service station sites, but exited from retailing during 2000. Burmah Fuels sold 53 retail service station sites in Victoria, New South Wales, and Queensland to convenience store operator 7-Eleven. While some Burmah Fuels retail service station sites were eventually picked up by BP as part of the worldwide acquisition of Burmah Fuels' parent company, Burmah Castrol PTE, the balance of the remaining Burmah Fuels' retail service station sites were sold to other parties unrelated to the oil majors.

Convenience chain store operator 7-Eleven had built up a retail network of 92 convenience stores that were also engaged in petrol retailing in the Sydney, Melbourne and Brisbane metropolitan areas by 2000. This number increased to 145 sites when 7-Eleven picked up 53 retail service station sites from Burmah Fuels in August 2000.

The Liberty chain of retail service stations was established in 1995 and operated in New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania. In July 2001, Woolworths announced that it had entered into an agreement with Liberty to lease 69 Liberty retail service station outlets with these sites converted over to Woolworths' Plus Petrol branded sites. While Liberty exited from petrol retailing, its brand name is still carried by dealer owned sites and Liberty continues to operate as a fuel wholesaler.

Gull Petroleum operates over 70 retail service station sites across Western Australia, with over 30 sites located within the Perth metropolitan area. Matilda Fuels operates in the Brisbane metropolitan and surrounding areas and operates from around 45 retail service station sites. Similarly, Neumann Petroleum operates from around 44 retail service station sites located throughout southeast Queensland and northern New South Wales.

Woolworths commenced petrol retailing by opening its first Woolworths Plus Petrol branded retail service station site in Dubbo in 1996. Woolworths steadily expanded its petrol retailing operation and by the end of June 2001 had opened 166 retail service station sites around Australia. Woolworths' originally announced a petrol pricing policy to match the lowest petrol price within a 3 km radius of a Woolworths Plus Petrol retail service station site, with consumers receiving a discount docket to access a 2 cents per litre (cpl) discount off their petrol purchase if they had spent at least $30 in any Woolworths supermarket or Big W store. Discounts on the retail price of

petrol offered in this manner have become known as *shopper docket* schemes.

In August 2003, Woolworths and Caltex announced plans for the establishment of a 50/50 retailing joint venture. Under this arrangement, a joint venture company (JVC) would be created to lease all of the Woolworths' Plus Petrol service station outlets, along with Caltex adding initially another 120 retail service station sites across Australia, with a further 40 Caltex retail service station sites to be added at a later stage. It was intended that the JVC would eventually build up its network to around 450 retail service station sites across Australia.

In May 2003, Coles Myer Ltd (Coles) and Shell announced that they had entered into a commercial alliance in regard to the retailing of petrol. Under this arrangement, Coles became the operator of Shell's core retail property network of 584 retail service station sites. The alliance began in Victoria in late July 2003, with Coles taking over the operation of 151 Shell retail service station outlets. At the commercial alliance retail service station sites, Coles grocery or liquor customers who spent $30 or more receive a discount docket with an offer to get 4 cpl off their next petrol purchase, similar to the petrol discount offer provided by Woolworths. Possibly in response to the alliance offer, Woolworths increased its petrol discount offer from 2 cpl to 4 cpl to customers who spent $30 or more in Woolworths or Big W stores.

It is not uncommon for suppliers to provide financial support for retail service station operators to compensate them in full or in part for revenue

shortfalls during periods of petrol price discounting.[38] Such financial support is known as *price support* and is usually provided on a lagged basis.[39] Price support is most commonly provided to the franchisees of the oil majors.

2.5.3 Legislative Controls and Codes of Conduct Governing Retailing

As a result of a lengthy history of disputation between the oil majors and retail service station operators, Commonwealth Government legislation was enacted along with a voluntary code of practice for mediating disputes between oil majors and retail service station operators, in particular franchisees.

There were two pieces of Commonwealth Government legislation that impacted on how the oil majors conducted their retailing operations. This legislation was introduced to address problems identified by the Royal Commission on petroleum conducted in the mid-1970s, including a lack of price competition between oil companies at the retail level, insecurity of tenure for leasees of oil company owned retail service station sites, and dissatisfaction on the part of retailers in regard to wholesale pricing arrangements with numerous complaints that oil companies engaged in price discrimination against retailers.[40]

The *Petroleum Retailing Marketing Sites Act 1980* (Sites Act) limited the number of retail service station sites that an oil major could directly own

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[38] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. xvi.
[39] *ibid.*, p. xvi.
[40] Royal Commission on Petroleum (1976) *Fourth Report: The Marketing and Pricing of Petroleum Products in Australia.* AGPS, Canberra.

and operate. The Sites Act was a policy attempt to curtail the extent of vertical integration in the downstream petroleum industry through partial divorcement of oil refiners from retailing activities. It was considered to be partial divorcement as the oil majors were not compelled to divest themselves entirely of retail service station sites, only to relinquish control through leasing out the sites.

The underlying philosophy behind the Sites Act was that vertical integration in the retailing of petroleum products was anti-competitive. According to the Department of Industry, Tourism and Resources:

> The Sites Act promotes competition in the retail petroleum market by encouraging diversity at the retail level and assisting the continuance of a viable, vigorous and competitive small business sector in the retail petroleum industry.[41]

The Sites Act operated through the allocation of a quota of retail service station sites that each oil major could operate based on average wholesale market share.[42] The quotas imposed on the four oil majors is provided below in table 6.

Table 6: Quota Allocations of Retail Service Station Sites under the *Petroleum Retail Marketing Sites Act 1980*

Oil Major	Quota
Caltex Australia Ltd	136
BP Australia Ltd	87
Mobil Oil Australia Ltd	87
The Shell Company of Australia Ltd	114

Source: Department of Industry, Tourism, and Resources (2002) *Downstream Petroleum Industry Framework 2002*. Canberra, p. 9.

[41] Department of Industry, Tourism and Resources (2002) *User Guide to the Petroleum Retail Marketing Sites Act 1980*. Canberra, p. 1.
[42] *ibid.*, p. 9.

Retail service station sites were exempted from the application of the Sites Act if an oil major operated them for four months or less, sold only diesel, or if the equity of an oil major in a site was 50 per cent or less.

The oil majors responded to the restrictions imposed upon them under the Sites Act through single site and multi-site franchising arrangements.

In terms of trying to limit the involvement of the oil majors in petrol retailing, the Sites Act was assessed as a policy failure by the ACCC:

> It is doubtful whether the Sites Act constrains oil major involvement in the retail sector as this can be achieved through other vertical arrangements. The oil majors have used franchising and 100 per cent ties to achieve the control at the retail level which the Sites Act sought to prevent.[43]

The *Petroleum Retail Marketing Franchise Act 1980* (Franchise Act) set minimum conditions regarding the contractual arrangements between franchisee retail service station operators and the companies supplying their fuel (franchisors). According to Grace, the Franchise Act sought to address perceived inequality in the bargaining position between the oil major franchisors in relation to their franchisees.[44]

The Franchise Act applied to all franchise agreements covering retail service station sites trading under a supplier's brand which sold over 360,000 litres of petrol per year. Because of restrictions imposed on the number of retail service station sites that an oil major could operate under

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[43] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 34.
[44] Grace, J. G. (1992) An Overview of Legislation Controlling the Retailing of Petroleum Within Australia: Part II. *Australian Business Law Review* 20, 7-30, p. 20.

the Sites Act, the Franchise Act was mostly applicable to the oil majors, although it did cover all franchise arrangements.

The minimum conditions imposed under the Franchise Act were:

- All information known by the franchisor relevant to the making of an informed decision should be provided to the franchisee at least three days prior to the franchisee entering the agreement;
- Tenure of three years with two further three-year terms at the option of the franchisee (in effect a nine-year term);
- The right to assign and appropriate goodwill;
- Franchisors should not impose unreasonable terms, including increasing rents or withdrawing rebates; and
- Price discrimination between like-branded franchisees is prohibited, except where the price difference can be justified by differences in the costs of supply or the need to meet competition.[45]

There is also state government legislation that imposes regulation on the retailing of petrol throughout Australia. In South Australia, the *Motor Fuel Distribution Act 1973* requires that all retailers of petrol are licensed. The South Australian Retail Outlet Board makes recommendations to the relevant South Australian Minister as to whether or not retail sales of motor fuel will be authorised from a particular site. The South Australian

[45] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 39.

legislation restricts the entry of new sellers into petrol retailing if their entry would provide unfair and unreasonable competition for existing retailers.[46]

Within the Australian Capital Territory, the Territory Government has exercised strong planning controls over the number and location of retail service station sites. Local government can also exercise town planning controls that can dictate where retail service station sites can be located.

In 1989, the TPC negotiated with oil companies, distributors and retailers and reached agreement on a code of conduct for the industry, known as Oilcode. The aim of the Oilcode was to reduce the bitter disputes and costly court cases that had occurred between oil company franchisors and their franchisees.[47]

Oilcode aimed to provide fair and reasonable conduct in relation to supply agreements and for the conciliation of disputes between the oil majors, distributors and retailers. It was administered by a committee, the Oil Industry Code of Practice Administration Committee (OICPAC). OICPAC was comprised of two representatives of the Australian Institute of Petroleum (AIP) representing the oil majors, two representatives of the Australian Petroleum Agents and Distributors Association (APADA) representing distributors, and two representatives of the Motor Trades Association of Australia (MTAA) representing retailers, with observers from the TPC/ACCC and the Department of Industry, Science and Resources.

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[46] National Competition Council (2001) *2001 NCP assessment*. Melbourne, p. 21.10.
[47] Grace, J. G., *op.cit.*, p. 27.

If disputes were unable to be resolved through the conciliation processes allowed for under the Oilcode, then parties were still able to pursue matters under common law, the Franchise Act, or the unconscionable conduct provisions of the *Trade Practices Act 1974* (TPA).[48]

The Commonwealth Government announced in March 2006 its intention to repeal the Sites Act and Franchise Act and replace them with a new mandatory Oilcode code of conduct. The Sites Act and the Franchise Act were repealed on 1 March 2007.

2.6 Government Influence over Petrol Pricing in Australia

There have been two direct avenues through which government, at both the Commonwealth and state level in Australia, have exerted an influence over petrol prices in Australia. Those avenues have been through the taxation and subsidisation of petrol, and through the imposition of some form of price regulation.

2.6.1 Taxation and Subsidies on Petrol

There have been various Commonwealth and state government taxes as well as state government rebates applied to the price of petrol.

Up until August 1997, all state governments, with the exception of Queensland, levied business franchise fees on the sale of petrol. In New South Wales, Victoria, and South Australia, the petrol franchise fee was levied in two parts. The first part was as a flat nominal fee imposed on

[48] Industry Commission (1994) *Petroleum Products*. Report No.40, AGPS, Melbourne; Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 169.

retailers who purchased their petrol from a licensed wholesaler. The second part was a fee payable as a given percentage of the *declared value* – in this case price per litre as determined by the state government and indexed for inflation. The variable component of the amount of petrol franchise fee applying in Sydney, Melbourne, and Adelaide is provided in table 7 below.[49]

Table 7: Variable Rate of Franchise Fee on Petrol (in cpl) from 30 June 1997 until 5 August 1997

City	Rate (cpl)
Sydney	7.88
Melbourne	7.67
Adelaide	9.85*

Source: Australian Institute of Petroleum (1998) *Oil and Australia Statistical Review 1997.* Melbourne.

*The variable rate of the franchise fee applying on the sale of petrol in Adelaide increased from 9.77 cpl to 9.85 cpl as from 1 July 1997.

On 5 August 1997, the High Court ruling on the legality of tobacco business franchise fees applied in New South Wales (*Ha and Lim v. New South Wales* and *Walter Hammond & Associates Pty Ltd v. New South Wales*) cast doubt on the constitutional validity of state government business franchise fees, including the petrol franchise fee. In this case, the High Court ruled that New South Wales tobacco business franchise fees were unconstitutional and in breach of section 90 of the Australian Constitution. As business franchise fees for petrol were structured along similar lines to tobacco business franchise fees, they were also considered to be vulnerable to legal challenge, and hence all state governments ceased their collection.

[49] It should be noted that the variable component rate of the business franchise fee on petrol in Adelaide was higher than applied in the rest of South Australia. Similarly, the variable component of the business franchise fee on petrol in Sydney was applied at the highest rate applying in New South Wales, where the rate was reduced in relation to the proximity of the Queensland border.

Following the ruling of the High Court, the state and territory governments requested immediate assistance from the Commonwealth Government in order to protect their budgets. The Commonwealth Government arranged for the collection of these taxes on behalf of the states and territories. On 6 August 1997, the Commonwealth Government announced *safety net* arrangements whereby it would increase the level of petrol excise levied and return the revenue collected (less administrative costs) to the states.[50]

At the time of the High Court's decision, each of the states had differing levels of business franchise fees. Because the Commonwealth Government is unable to discriminate between states or part of states under section 51(ii) of the Constitution, the Commonwealth Government increased its excise rate by 8.1 cpl across the board. A condition of the Commonwealth Government's safety net provisions was that petrol prices not increase because of this arrangement. To meet the Commonwealth Government's condition, the Victorian and the New South Wales Governments made payments to petrol wholesalers equal to the difference between the additional 8.1 cpl in Commonwealth Government excise and the former business franchise fee on petrol. The New South Wales Government provided an interim subsidy of 0.22 cpl on the sale of petrol from August 1997 until November 1997. The Victorian Government provided a subsidy of 0.43 cpl that was finally rescinded on 1 July 2007. While South Australia and New South Wales continue to operate fuel subsidy schemes, these relate exclusively to petrol retailed outside the metropolitan areas of Adelaide and

[50] The arrangement to return the proceeds to the states arising from the 8.1 cpl increase in petrol excise was discontinued by the Commonwealth Government with the introduction of the goods and services tax in July 2000.

Sydney respectively, and hence have no impact on the price of petrol sold in those cities.[51]

The Commonwealth Government levies an excise tax on the sale of petrol in Australia, set at a particular rate in cpl. Responsibility for paying the excise rests with the manufacturer.[52] Refiners pass the cost of the excise on to buyers of petrol, so the excise is finally passed on to motoring consumers through the chain of supply.

From August 1983 until March 2001, petrol was indexed on a biannual basis in March and August for movements in the consumer price index. Indexation was abolished in March 2001 when the Commonwealth Government decided to scrap indexation arrangements after considerable political pressure was applied around the country by motoring organisations. Coinciding with the abolition of indexation of petrol excise, the rate of excise was also cut by 1.5 cpl.

There have also been two other changes made to the rate of petrol excise aside from those relating to indexation. First, the Commonwealth Government increased the rate of petrol excise by 8.1 cpl following the decision of state governments to abolish franchise fees on petrol in August 1997 (further details have been provided above).

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[51] The New South Wales Government pays subsidies for five zones in Northern New South Wales to enable local sellers of petroleum products to compete with subsidised sellers across the border in Queensland. The zonal subsidies decrease as the distance from the Queensland border increases.
The South Australian Government pays subsidies for two zones – between 50 km and 100 km from the Adelaide GPO excluding the Yorke Pennisula (zone 2) and over 100 km from the Adelaide GPO (zone 3).

[52] Customs duty is levied on comparable imports so that imports and domestic goods are taxed at the same rate.

Second, the Commonwealth Government reduced the rate of petrol excise on 1 July 2000 by 6.656 cpl to coincide with the introduction of the goods and services tax (GST) in order to offset the impact of the GST on petrol prices (further details on the GST are provided below). The rates of excise applying to unleaded petrol during the period under examination is provided in table 8 below.

Table 8: Rate of Excise on Unleaded Petrol (in cpl)

Date Implemented	Unleaded Petrol Excise
3 February 1997	34.697
6 August 1997	42.797
1 February 1998	42.797 (No change)
1 August 1998	43.054
1 February 1999	43.355
2 August 1999	43.485
1 February 2000	44.137
1 July 2000	37.481
1 August 2000	38.118
1 February 2001	39.643
2 March 2001	38.143

Source: Webb, R. (2000) *Petrol and Diesel Excises*. Parliament of Australia Parliamentary Library; Commonwealth of Australia (2001) *2001-02 Budget Paper No.1: Budget Strategy and Outlook 2001-02*. AusInfo, Canberra, p. 5-18.

The Commonwealth Government introduced a broad-based GST on 1 July 2000 which applied to most commodities and services, including petrol. The GST is applied on an *ad valorem* basis at the rate of 10 per cent. The GST is applied separately on each transaction within the supply chain.[53]

Associated with the implementation of the GST, the Commonwealth Government also introduced the Fuel Sales Grant Scheme (FSGS) as of 1 July 2000. The FSGS provided a subsidy to motoring consumers of petrol in regional and remote areas by providing a grant payment to petrol retailers in defined non-metropolitan zones. The FSGS was paid at the rate of 1 cpl for

[53] As businesses are able to claim GST input tax credits for the amount of GST paid on intermediate inputs, the GST is borne only on the final consumption of petrol.

the non-metropolitan zone and 2 cpl for the remote zone. The FSGS was terminated on 1 July 2006.

2.6.2 Regulation of Petrol Prices

The price of petrol was subject to either price control or prices surveillance mechanisms at the Commonwealth or state government level from February 1940 until August 1998. Price controls were initially introduced by the Commonwealth Government to coincide with petrol rationing during World War II in order to control inflation and prevent profiteering.[54] These controls operated through the Commonwealth Government setting a maximum wholesale price calculated by a formula based on the landed cost of refined petroleum products on the Australian seaboard and the cost of distribution.[55]

When the Commonwealth Government removed price controls over petrol in September 1948, all state governments stepped in and filled the breach by enacting their own price controls following the formula previously applied by the Commonwealth Government in setting a maximum wholesale price. These price control regimes were gradually abandoned in all states except South Australia. From 1954 until May 1974, the South Australian price control system became the *de facto* price control system for Australia.[56]

The Commonwealth Government re-engaged in scrutinising petrol prices with the enactment of the *Prices Justification Act 1973* which established the Prices Justification Tribunal (PJT). The purpose of the PJT was not to

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[54] Grace, J. G. (1991) An Overview of Legislation Controlling the Retailing of Petroleum within Australia. *Australian Business Law Review* 19, 391-403, p. 392.
[55] Royal Commission on Petroleum, *op.cit.*, p. 331.
[56] *ibid.*, p. 332.

engage in price control as such, but in price justification. The PJT conducted 11 inquiries into petrol pricing between 1973 and 1980, most of which were triggered by oil company notification of higher prices.[57]

The role of the PJT in scrutinising petrol prices was replaced in 1981 by the Petroleum Products Pricing Authority (PPPA) following the enactment of the *Petroleum Products Pricing Authority Act 1981*. Following the enactment of the Commonwealth *Prices Surveillance Act 1983*, the PPPA was subsumed into the new Prices Surveillance Authority (PSA).

Between 1981 and 1983, governments in New South Wales, Victoria, South Australia, and Western Australia reintroduced forms of wholesale and retail price controls. However, these states agreed to a unified system of prices surveillance for petrol operated by the PSA, and all but Western Australia withdrew from price controls.[58]

The PSA eventually merged with the TPC in 1996 to form the ACCC.

All of the refiner/marketer companies operating in Australia were declared under the Prices Surveillance Act. Under section 22 of the Prices Surveillance Act, declared companies were required to notify the PSA/ACCC of proposals to increase wholesale prices above the previously endorsed maximum price.[59] The PSA/ACCC endorsed individual company maximum wholesale prices for the sale of petrol provided the price proposed was at or below the Import Parity Indicator price (IPI) calculated

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[57] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 4.
[58] Industry Commission, *op.cit.*, p. I.4.
[59] Australian Competition and Consumer Commission (1996) *Inquiry into the Petroleum Products Declaration*. Vol. 2, Appendixes, AGPS, Canberra, p. 26.

by the PSA/ACCC.[60] The calculation of the IPI was composed of three components:

- The import parity component – the *landed cost* for ex-refinery petrol stock from Singapore (incorporating the spot price for fuel[61], freight, wharfage, insurance and loss, and the Australian/US dollar exchange rate);

- The assessed local component – which reflected influences such as downstream terminalling, marketing and distribution costs as well as return on assets employed in that sector; and

- Excise and state government subsidies, and the GST.[62]

Singapore was considered the appropriate benchmark for Australian petrol prices as it is the closest major refining and marketing centre. Also because Singapore is the third largest refining and marketing centre in the world after Rotterdam and Houston, it was considered to be the most likely source of imported product coming into Australia.

In its inquiry into the downstream petroleum industry in 1994, the Industry Commission concluded that wholesale petrol price regulation within cities was "unnecessary because of the vigorous competition observed in those markets".[63] The Industry Commission also opined that the effectiveness of competition in some country retail petrol markets was not addressed by

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[60] *ibid.*, p. 26.
[61] The spot price used is based on a 7-day rolling average of spot prices. See: Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration.* Vol. 2, p. 27.
[62] Australian Competition and Consumer Commission (2001) *Reducing Fuel Variability: Discussion Paper.* Canberra, p. 10.
[63] Industry Commission, *op.cit.*, p. 125.

wholesale petrol price regulation.[64] The Industry Commission recommended that wholesale petrol prices should be deregulated.

Similarly, the ACCC opined in 1996 that the regulation of wholesale petrol prices did "not serve a very useful purpose".[65] The ACCC contended that in rural areas the regulation of wholesale petrol prices had been rendered ineffective through the oil majors selling product through distributors who were not subject to the regulation. In regard to capital cities, the ACCC found that the regulation only restrained petrol prices occasionally and by very little. The ACCC also contended the regulation of wholesale petrol prices had an adverse effect on capital city retail petrol markets by encouraging the oil majors to charge the maximum price allowed rather than a lower price.

In July 1998, the Commonwealth Government announced that it was revoking the declaration on the refiner/marketers and deregulating wholesale petrol prices as from 1 August 1998. Echoing the views of the ACCC, the Commonwealth Government asserted that the price regulation had resulted in distortions across various markets, resulting in higher retail petrol prices:

> Price surveillance of petrol prices and the setting of a maximum endorsed wholesale price has had an adverse effect on the retail petrol market. In the capital cities, the maximum endorsed wholesale price has acted as a target for prices at the end of a discount cycle. In

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[64] *ibid.*, p. 125.

[65] Australian Competition and Consumer Commission (1996) ACCC recommends end to petrol declaration when competitive forces re-structure fuel industry. *Media Release*, 15 August.

> the country, the maximum endorsed wholesale price has acted as a price floor underwriting the price paid by country consumers.[66]

While prices surveillance of petrol prices has been removed nationally by the Commonwealth Government, the Western Australian Government moved back into the field in April 2001 following the passage of the Western Australian *Petroleum Products Pricing Amendment Act 2000.* A price cap was imposed on the wholesale price of petrol in Western Australia through the determination of a maximum price based on an import parity pricing model.

Under the Australian Capital Territory's *Fair Trading (Fuel Prices) Act 1993*, the designated Minister is able to regulate the prices of certain fuels if the market were acting in a collusive or anti-competitive manner, although the powers under this Act have never been exercised.[67]

At the Commonwealth Government level, the Prices Surveillance Act was repealed in 2004 and the powers to direct the ACCC to engage in price monitoring and prices surveillance activities were subsumed into the TPA.

The Federal Opposition is proposing to reinstitute some form of prices surveillance under the TPA in the event that it is elected to government after the next federal election.[68] The Federal Opposition has said that it will

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[66] Costello, P. and Moore, J. (1998) Petroleum Marketing Reforms. *Media Release*, Joint Statement by the Australian Government Treasurer and the Minister for Industry, Science and Tourism, 20 July.
[67] National Competition Council, *op.cit.*, p. 21.10.
[68] It should be noted that this thesis was completed before the 2007 federal election.

appoint a Petrol Commissioner to the ACCC who will be given full powers to monitor and investigate petrol prices under the TPA.[69]

2.7. Pricing and Competition Issues

2.7.1 Competition in the Downstream Petroleum Industry

It is arguably the case that petrol is a homogeneous product and that price forms the main basis upon which wholesalers and the retailers they supply compete against each other. This is evidenced by the display of price boards at just about every retail service station site location around Australia. The critical importance of pricing to retail market competition has been acknowledged by the AIP:

> For many consumers, petrol is often treated as a commodity product generating little brand loyalty, meaning competition is largely based on price.[70]

On the demand side, the homogeneous nature of petrol to the consumer has been recognised in Australia by the Industry Commission which commented that "[t]o the overwhelming majority of consumers *petrol is petrol*" and by Access Economics who contended that demand for an individual brand of petrol "will be highly elastic due to competitive substitution for other brands in response to price discounting".[71]

Evidence of the homogeneous nature of petrol on the supply side comes from the very existence of REAs that previously enabled refiners to retail

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[69] Rudd, K., Bowen, C. and Swan, W. (2007) Rudd Labor Government to Appoint Petrol Commissioner. *Media Release*, Joint Statement by the Leader of the Opposition, the Shadow Assistant Treasurer, Revenue and Competition Policy and Shadow Treasurer, 12 June.

[70] Australian Institute of Petroleum (2006) *Submission to the Inquiry into Future Oil Supply and Alternative Transport Fuels*. Canberra.

[71] Industry Commission, *op.cit.*, p. 57; Access Economics (1991) *The Right Price*. Canberra, p. 40.

petrol manufactured by other refiners in Australia. The Royal Commission on Petroleum conducted in the mid-1970s also came to the considered view that petrol was a homogeneous product despite concerted attempts by petroleum marketers to persuade consumers otherwise:

> The Commission is satisfied that, although there may be some marginal difference between one [petrol] and another, according to the inclusion or lack of additives, the virtues attributed by the marketers to the [petrol] sold under their various brands is part of a market strategy of promoting brand image product differentiation where there is no real difference in the product being sold.[72]

In summary, the ACCC has concluded that petrol is a homogeneous product on both the demand and the supply side:

> Arguably, petroleum products are homogeneous (like grade for like grade) in both a technical sense and as perceived by consumers, who appear generally unwilling to remain with one brand when another brand is marginally cheaper.[73]

Overseas, the homogeneous nature of petrol has been recognised by Lowe, Shepard, and the US Federal Trade Commission (FTC) amongst others.[74]

It is possible that competition could occur in retail petrol markets based on criterion other than price such as quality of the product and the level of service. As petrol is generally considered to be a homogeneous product by consumers, it is doubtful if retailers compete against each other on the basis

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[72] Royal Commission on Petroleum, *op.cit.*, pp. 47-48.
[73] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 112.
[74] See: Lowe, J. F., *op.cit.*, p. 204; Shepard, A. (1990) Pricing Behaviour and Vertical Contracts in Retail Markets. *The American Economic Review* 80, 427-431, p. 427; Federal Trade Commission (1999) *Statement of Chairman Robert Pitofsky and Commissioners Sheila F. Anthony and Mozelle W. Thompson, BP / Amoco, Docket No. C-3868.* Washington DC, 15 January.

of quality for regular unleaded petrol.[75] If a consumer is purchasing petrol from a retail service station site, it is also doubtful that issues such as standard of service would be a significant factor. The vast majority of retail service station sites converted over to self-service arrangements during the 1980s and 1990s after Shell first introduced it in April 1976.

Wholesalers and retailers may also attempt to compete against each other on the basis of marketing. Such marketing would probably take the form of trying to differentiate their product from that of their competitors. As petrol is viewed as a homogeneous product, marketing strategies based around product differentiation are likely to meet with only limited success. As the Industry Commission recognised in 1994: "the ability of the oil companies to benefit from product differentiation is limited by the homogeneous nature of the core product".[76]

Other factors upon which petrol retailers could compete are on the basis of convenience in terms of trading hours and location.

Despite the existence of non-price factors upon which petrol retailers can also compete, it is not unreasonable to assume that price is the main criterion upon which competition occurs within the downstream petroleum industry, given the homogeneous nature of the product and the likely high price elasticity of demand for an individual brand of petrol. The ACCC and the Industry Commission have both concluded that the price of petrol is the

[75] Despite this, it is arguably the case that retailers do compete against each other on the basis of quality in relation to premium unleaded petrol which is marketed as a superior product by retailers in comparison to regular unleaded petrol and is also priced at a premium to regular unleaded petrol.
[76] Industry Commission, *op.cit.*, p. 57.

main basis upon which competition takes place within the Australian downstream petroleum industry.

2.7.2 Relative Petrol Prices in Australia

Several parties have claimed that Australia has some of the lowest retail petrol prices in the world based on price comparisons produced by the International Energy Agency (IEA). According to the Department of Industry, Tourism, and Resources in 2002:

> it is not well known that amongst the countries of the Organisation for Economic Cooperation and Development ... Australia has the lowest pre-tax petrol price and third lowest post-tax retail prices.[77]

Similarly, the AIP in 2003 opined that:

> Australia continues to have the lowest pre-tax price for petrol in the OECD and the third lowest price including tax.[78]

Table 9 below shows that Australia recorded the lowest average petrol prices pre-tax, and the third lowest average petrol prices overall amongst OECD nations in the June quarter 2001.

[77] Department of Industry, Tourism, and Resources, *Downstream Petroleum Industry Framework 2002*, p. 1.
[78] Australian Institute of Petroleum (2003) *Downstream Petroleum 2003*. Canberra, p. 14.

Table 9: Comparison of Retail Petrol Prices in OECD Countries – June Quarter 2001

Country	Pre-Tax Price (cpl)	Price AUS$ (cpl)	Tax AUS$ (cpl)
Australia	45.5	92.0	46.5
New Zealand	51.5	89.7	38.1
Turkey	55.4	142.7	87.3
Germany	55.4	181.2	125.8
UK	56.1	214.8	158.7
Canada	58.5	96.6	38.1
France	59.5	187.7	128.3
Ireland	60.6	143.7	83.1
Czech Republic	61.0	139.9	78.9
Poland	62.4	157.7	95.3
Spain	63.0	146.3	83.3
Austria	63.7	161.0	97.3
Switzerland	64.7	158.6	93.9
Belgium	64.8	182.7	117.9
Hungary	65.0	157.9	92.9
United States	66.1	85.8	19.6
Sweden	66.5	188.0	121.4
Norway	66.6	208.2	141.7
Denmark	67.3	197.1	129.9
Italy	67.7	187.3	119.6
Greece	68.0	139.7	71.7
Finland	70.0	197.1	129.9
Netherlands	70.9	207.7	136.8
Japan	80.4	174.0	93.6
Portugal	83.4	155.1	71.7
Mexico	99.5	114.4	14.9
South Korea	189.0	189.0	0.0

Source: Commonwealth Treasury (2002) *Treasury Submission to the Fuel Taxation Inquiry*. Canberra.

While the ACCC has acknowledged that IEA statistics demonstrate "that metropolitan prices in Australia are not excessive relative to most other countries", nevertheless it has expressed "some reservations about the comparability of some of the data, associated with the removal of taxes and the sampling methodology applied".[79]

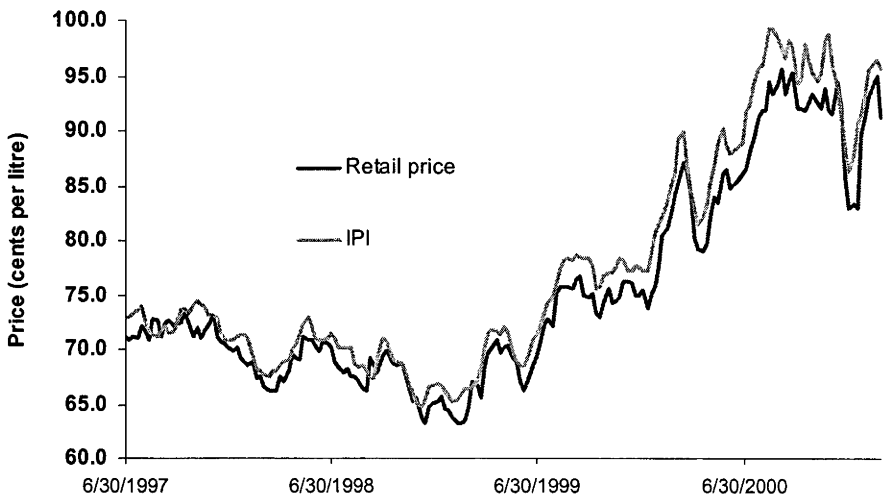
2.7.3 Pricing and Competition in Capital City Retail Markets

Retail petrol prices within the capital cities closely follow movements in the IPI. The close relationship between capital city retail petrol prices and the

[79] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 110.

IPI is illustrated in chart 1 below which maps average weekly Adelaide retail petrol prices against the weekly average IPI.

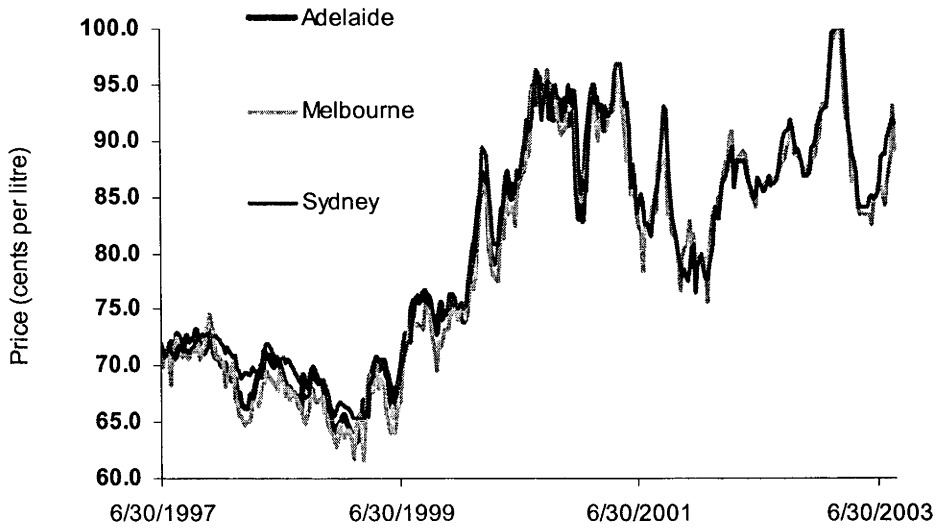
Chart 1: Weekly Average Adelaide Retail Petrol Prices and the Weekly Average IPI from 30 June 1997 to 26 February 2001.



Source: Australian Competition and Consumer Commission and Informed Sources.

Given the close relationship between capital city retail petrol prices and the IPI, retail petrol prices across the capital cities follow each other closely. The close relationship between capital city retail petrol prices is illustrated in chart 2 below which maps average weekly retail petrol prices for Adelaide, Melbourne and Sydney.

Chart 2: Average Weekly Retail Petrol Prices for Adelaide, Melbourne and Sydney from 30 June 1997 to 25 August 2003



Source: Informed Sources.
Note: Data for Adelaide only runs to 26 February 2001.

There are two main contentious issues surrounding the retail price of petrol in Australia. The first issue is the level of price volatility observed in the major capital cities of Sydney, Melbourne, Brisbane, Adelaide and Perth. Canberra, Hobart and Darwin have not been subject to the same level of price volatility as the other capital cities. The second issue is that of the price differential between city and country retail petrol prices which will be considered in the following section.

The ACCC has observed that retail price volatility is generally confined to major capital cities and some strategically located rural towns on major highways.[80] As a result, there are price cycles observed in these locations which follows a recurring sawtooth pattern, notably that prices rise rapidly

[80] *ibid.*, p. 67.

in a short period of time and then steadily decrease.[81] Castanias and Johnson have observed that retail petrol price cycles of this nature are consistent with the duopoly model of Maskin and Tirole.[82] The duopoly model of Maskin and Tirole will be further considered in the next Chapter.

According to Harris (Shell), competition at the retail level drives the pump price down as individual service stations or brands start to discount their price by a small amount in order to attract volume.[83] Other service stations in turn quickly match these prices in order to remain competitive with highly visible petrol pricing boards allowing both customers and retail competitors alike to observe price changes.[84] Harris comments that once discounting starts or ends in a particular area, strong competition means that it quickly spreads into other regions.[85] Harris observes that petrol prices are normally discounted for six days or more, and then only go up once a week.[86]

The ACCC has previously identified two main causes of retail petrol price volatility:

- The wholesale prices of the oil majors are based on international ex-refinery bulk spot prices in Singapore and fluctuations in those prices, as

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[81] Australian Competition and Consumer Commission (2005) *Understanding petrol pricing in Australia: Answers to some frequently asked questions*. Canberra, p. 6.
[82] Castanias, R. and Johnson, H. (1993) Gar Wars: Retail Price Fluctuations. *The Review of Economics and Statistics* 75, 171-174.
[83] Harris, P. C. (2002) Petrol Price Movements: One of the oil companies provides an explanation. *Motoring Directions* Issue 1 2002, 10-12, p. 11.
[84] *ibid.*
[85] *ibid.*
[86] *ibid.*

well as in the value of the Australian dollar as compared to the US dollar, can eventually flow into retail prices.[87]

- Varying levels of wholesale price support applied by the oil majors to selected petrol retailers.[88]

Other possible causes of retail price volatility that have been suggested are: excess product at refineries; the presence of independent chains; competition for market share; and a response to low demand in the early part of the week and higher demand towards the weekend.[89]

Petrol price volatility and the angst it creates for consumers have provoked several political responses across the country. In late 2000, the Western Australian Government passed the *Petroleum Products Pricing Amendment Act 2000*, which sought to fix retail petrol prices for a 24-hour period as from January 2001.

In March 2001, the Commonwealth Government requested the ACCC examine the feasibility of placing limitations on retail petrol price fluctuations throughout Australia.[90] The ACCC reported back to the Commonwealth Government in December 2001 recommending against any measures to contain price fluctuations. The ACCC recommended instead

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[87] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 67.
[88] *ibid.*, p. 68.
[89] *ibid.*, p. 68.
[90] Australian Competition and Consumer Commission, *Reducing Fuel Price Variability: Discussion Paper.*

that a greater emphasis should be placed on increasing consumer awareness of retail petrol price cycles.[91]

Opinions expressed as to whether capital city retail markets are competitive or not have been mixed. While some have claimed that retail markets in capital cities are prone to collusive conduct, others have asserted that they are highly competitive. It has also been noted that the Australian public remains sceptical regarding the level of competition within capital city retail markets, especially when they observe price discounting come to an abrupt end coupled with substantial price rises across all outlets within a relatively short space of time.

In 1994, the Industry Commission came to the view that there was effective competition in most petroleum product markets most of the time.[92] According to the Industry Commission, the oil majors had to overcome considerable difficulties in order to co-operate, either explicitly or tacitly, to raise prices over any prolonged period of time.[93]

In contrast, the ACCC in 1996 was firmly of the view that markets within the downstream petroleum industry were not competitive, contending that the oil majors possessed significant market power based on high concentration levels, high barriers to entry, and the depth and breadth of vertical and horizontal relationships between them.[94] The ACCC further

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[91] Australian Competition and Consumer Commission (2001) *Reducing Fuel Price Variability*. Canberra.
[92] Industry Commission, *op.cit.*, p. XIX.
[93] *ibid.*, p. XVIII.
[94] Australian Competition and Consumer Commission, ACCC recommends end to petrol declaration.

opined the oil majors "exercised strong influence over prices and terms and conditions throughout retailing".[95]

One reason for differing opinions on the level of competition within capital city retail markets largely revolves around differing and conflicting interpretations of the price cycles observed. While some regard the price cycles and the accompanying price discounting as evidence of vigorous competition, others consider some aspects of the price cycle as constituting predatory conduct, while the coalescence of the price at the same level at the end of a discounting cycle as evidence of collusive conduct.

Claims of anti-competitive conduct in the downstream petroleum industry have become commonplace. As the Senate Economics Committee observed in 2001:

> Suspicion ... often falls on the oil companies which some suspect of manipulating wholesale and retail prices and minimising competition in order to preserve and enhance their profitability.[96]

There are two primary sources of complaint regarding anti-competitive conduct. On the one hand, consumers, politicians, and motoring organisations have often accused the oil industry in general, and the oil majors in particular, of price fixing and collusion, whether it be tacit or overt. On the other hand, organisations representing retail service station operators have accused the oil majors of engaging in predatory pricing by setting retail petrol prices far too low and of engaging in price

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[95] *ibid.*

[96] Senate Economics Committee (2001) *Inquiry into the provisions of the Fair Prices for All (Petroleum) Bill 1999 and the practice of multi-site franchising by oil companies.* Canberra, p. 1.

discrimination by selling petrol to some customers at lower wholesale prices than is otherwise generally available. While there are disagreements over a precise definition of predatory pricing, it generally involves temporary selling, at prices below its costs, by a firm (or group of firms) to drive out or crush a competitor.[97]

Politicians as well as motoring organisations (representing the interests of motorists) have regularly made assertions that the oil majors engage in price fixing and profiteering. Such claims are regularly made in response to price rises that appear to be made simultaneously by oil major branded retail service station sites as well as significant retail price rises before public holidays and long weekends.

Attacks by politicians on the pricing behaviour of the oil majors is frequent and is engaged in by representatives of both major political parties within Australia at both the state and federal level. In response to a simultaneous price increase across several retail service station sites in Maitland in August 2000, the then New South Wales Minister for Consumer Affairs John Watkins commented that:

> It is very suspicious that all of the petrol stations in Maitland – except two independents – would decide independently to increase their prices...
>
> This smacks of price rigging.[98]

[97] Yamey, B. S. (1972) Predatory Price Cutting: Notes and Comments. *Journal of Law and Economics* 15, 129-142, p. 129.
[98] *The Daily Telegraph* (1999) Inquiry into 10c petrol price rise. 5 August: 17.

In response to a rise in retail petrol prices before Anzac day in 2001, the Prime Minister, John Howard, commented:

> The public anger at the sharp increase on Anzac Day is palpable and understandable and I want that investigated and the ACCC has the power to do it...
>
> The ACCC should throw the book at the companies if there's any evidence of collusion.[99]

Similarly, the then Leader of the Federal Opposition, Simon Crean, in 2002 insinuated that the oil majors engaged in price fixing before holiday periods:

> How do the oil companies justify 10 cent price hikes before Easter?
>
> No market forces can miraculously produce that sort of an outcome; the only change in circumstances is that it's a public holiday.[100]

Motoring organisations have also accused the oil majors of engaging in price fixing and profiteering over the years. In December 1997, the Royal Automobile Club of Victoria (RACV) called for the granting of telephone tapping powers to the ACCC in order to prove that price-fixing occurs amongst oil companies.[101] In April 2002, the National Road Motorists Association (NRMA) claimed that while sharp rises in petrol prices on certain days were not evidence of price fixing, it gave strong cause for suspicion.[102]

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[99] *Australian Associated Press News Wire* (2001) Fed – Public right to be angry at petrol price rises says Howard. 27 April.
[100] *Australian Associated Press Financial News Wire* (2002) Crean rejects industry's cry poor claims. 27 April.
[101] *Herald Sun* (1997) RACV urges phone tap power. 22 December: 22.
[102] *The Sydney Morning Herald* (2002) NRMA Chief Suspicious of Patterned Rise in Petrol Prices. 25 April: 4.

Public opinion polling by the Australian Automobile Association, the peak body for motoring organisations across Australia, also revealed deep suspicion regarding the reason for petrol price rises across metropolitan areas:

> Motorists have their pet theories for these fluctuations: some put it down to the day of the week, school holidays or because it's pay day or pension, while others nominate a phone call from the big oil company as the cause.[103]

The oil majors are acutely aware of the firmly held public suspicion that they engage in price fixing and profiteering. According to Starkey (AIP):

> community perception of the industry is that it is not competitive and that consumers are being exploited by the companies.[104]

The oil majors have often sought to vigorously deny claims that they engage in price fixing. According to McGimpsey (BP):

> There's a perception that we (refiner/marketers) collude on a whole range of issues... But we are in fact in fierce competition with one another.[105]

Warburton (Caltex) sought to explain the price cycles in the following terms:

> There is no price fixing but there is, I repeat, very vigorous price following.
>
> In a downward spiral, the profit is driven into negative territory.

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[103] Cameron, R. (1998) What 'Battlers' Have to Say about Fuel Prices and Taxes. *Motoring Directions* 4(2), 9-12, p. 10.
[104] Starkey, J. (1996) The Downstream Petroleum Industry – A Commentary. *[1996] AMPLA Yearbook*, 379-385, p. 381.
[105] McGimpsey, R. (1998) The Petroleum Industry's Distortions and Anomalies. *Motoring Directions* 4(2), 13-15, p. 14.

> Eventually, like a pressure cooker, the pressure on all parties to return to profitability causes someone to break and there is usually a very willing and rapid following of that first upward movement.[106]

Several independent observers have claimed that the retail petrol price cycles observed are in fact evidence of vigorous competition. According to Access Economics: "periodic discounting wars suggest intense competition for market share".[107] Similarly, the Industry Commission opined that petrol price discounting "is indicative of strong competition".[108]

While the price support offered by oil majors to their franchisees could be interpreted as an attempt to help franchisees survive in a competitive retail market, some franchisees have argued that the provision of price support is a market control mechanism that allows the oil majors to exercise significant leverage over their franchisees.[109] Franchisees claim that if they were able to purchase petrol at a realistic wholesale price in the first instance, then they would not require price support at all.

Claims of predatory pricing by the oil majors abound. The Industry Commission commented that many participants in its 1994 inquiry into the petroleum industry alleged that the oil majors engaged in predatory pricing practices.[110] According to the MTAA[111] (representing retail service station operators):

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[106] *Asia Pulse Wire Service* (2002) Caltex Australia Says No Price Fixing in Petrol Prices in Urban Areas. 2 May.
[107] Access Economics, *op.cit.*, p. 42.
[108] Industry Commission, *op.cit.*, p. XX.
[109] *ibid.*, p. 27.
[110] Industry Commission, *op.cit.*, p. 74.
[111] The MTAA represents single site franchisees, multi-site franchisees, commission agents, branded dealer-owned sites and unbranded dealer-owned sites.

> Australia's service station operators are frequently victims of predatory pricing by the oil majors. Independent operators are sold fuel at wholesale prices above what is charged at retail by others.[112]

Similarly, the Independent Petroleum Marketers Association of Australia (PMAA), representing dealer-owned retail service stations, has opined that:

> It is only within this industry that the discount prices available for retail petroleum purchases from the oil companies' chains are truly predatory to the wholesale cost prices for the same product available from the same oil companies to the independent operators.[113]

Claims of price fixing and collusion often made against oil companies by politicians and motoring organisations may appear at face value to be inconsistent and contradictory with claims of predatory pricing made by service station operators. This apparent anomaly is further explored in the next Chapter in examining vertical pricing issues.

2.7.4 Pricing and Competition in Country Retail Petrol Markets

While country petrol prices are generally higher than city petrol prices, average movements in country petrol prices generally follow average movements in city petrol prices through time. The close relationship between capital city retail petrol prices and country retail petrol prices is illustrated in chart 3 below which maps average monthly Sydney retail petrol prices against the average monthly retail petrol prices for the New South Wales country towns of Griffiths and Port Macquarie.

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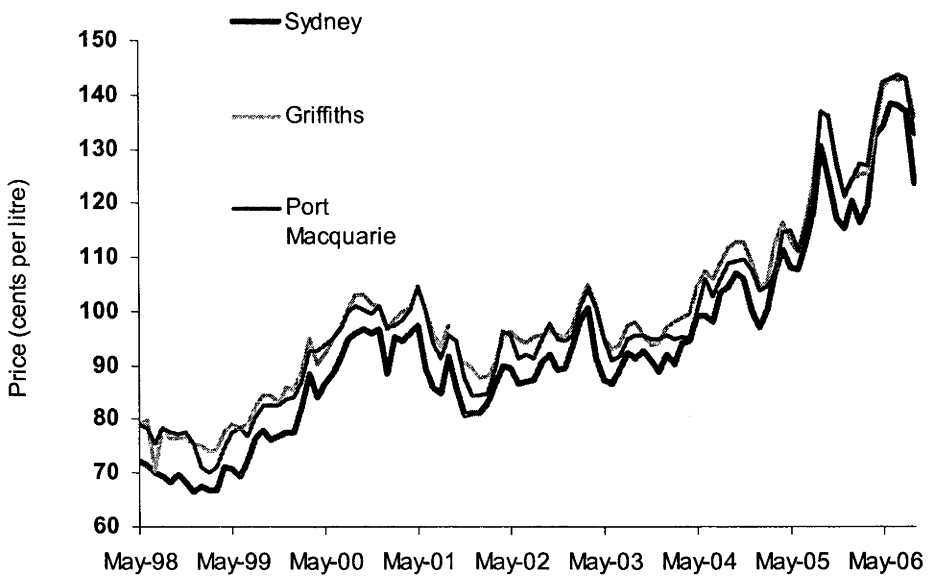
[112] Motor Trades Association of Australia (2002) *Submission by the Motor Trades Association of Australia to the Review of the Trade Practices Act*. Canberra.
[113] Independent Petroleum Marketers Association of Australia (2002) *Submission to the Senate Legal and Constitutional Reference Committee for the Committee's Inquiry into the Trade Practices Act 1974*. Melbourne, p. 5.

Chart 3: Average Monthly Retail Petrol Prices for Sydney, Griffiths and Port Macquarie from May 1998 to September 2006.



Source: Australian Automobile Association. Issues for Motorists: Petrol Prices. http://www.aaa.asn.au/issues/petrol.htm [Accessed 15 March 2007]

One consequence flowing from the petrol price volatility observed in the major capital cities is that it can heighten perceptions of the extent of the price differential between city and country petrol prices when city petrol prices are at the bottom of the price cycle. In its examination of the downstream petroleum industry in 1996, the ACCC found that higher retail petrol prices generally applied in country areas due to a combination of factors:

- Higher freight costs;
- Lower volume of throughputs;
- Less diversity of revenue sources for country outlets;
- Higher retail margins;

- Lower levels of competition;
- The absence of independent retail chains;
- The general absence of wholesale and retail price discounting;
- Regular and sometimes deep wholesale price discounting in capital cities which causes differences with country areas to expand;
- The greater potential for oil major *clawback* of retailers' margins, which could result in operators seeking higher margins;
- The greater likelihood of conscious price parallelism and possibly collusion existing between country dealers and distributors; and
- Availability of some *under-the-canopy* discounts and the extent of oil company card sales which can result in retailers applying higher pump prices to offset these effects.[114]

Both the Industry Commission and the ACCC have acknowledged that there is an absence of competition in some country retail petrol markets. The Industry Commission observed in 1994 there were some country centres and smaller country towns where high retail price margins on petrol could not be fully explained in terms of extra costs and that this may be the result of collusive behaviour - whether it be overt or tacit.[115]

The ACCC found in 1996 that in many of the larger country centres, retailers tended to adopt a *live and let live* strategy by seeking to avoid price

[114] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 94.
[115] Industry Commission, *op.cit.*

competition that could drive rivals out.[116] The ACCC concluded that in country retail petrol markets there existed the greater likelihood of conscious price parallelism and possibly collusion existing between country retailers and distributors.[117]

Support for the concerns expressed by both the Industry Commission and the ACCC in regard to possible collusive conduct in some country areas have come from a recent court case where the ACCC successfully prosecuted several parties for engaging in price-fixing conduct in breach of the TPA in the region of the Victorian country city of Ballarat.[118] In this case, the ACCC instituted proceedings against 16 companies and individuals alleging a number of competitors in the Ballarat region were part of a long-standing arrangement to fix retail petrol prices.[119] In this case, the Federal Court awarded penalties of more than $20 million in May 2005 against the respondents for price fixing conduct, although two of the respondents successfully appealed against the judgement to the Full Federal Court.[120]

The ACCC also initiated proceeding against 18 respondents alleging that they fixed retail petrol prices in the Victorian city of Geelong during 1999-

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[116] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 94.
[117] *ibid.*, p. 94.
[118] *Australian Competition and Consumer Commission v Leahy Petroleum Pty Ltd & ors (Ballarat).*
[119] Australian Competition and Consumer Commission (2005) Federal Court orders $23.3 million in penalties for petrol price-fixing. *Media Release*, 17 March.
[120] Australian Competition and Consumer Commission (2006) High Court dismisses ACCC – APCO special leave application. *Media Release*, 5 June.

2000.[121] While the Federal Court dismissed the ACCC action in May 2007, the ACCC observed that:

> There was no dispute by many of the respondents in the Geelong proceedings that they communicated about petrol prices. What was disputed in court was whether those communications amounted to an 'arrangement or understanding' being reached between the parties as to how they would price their petrol.[122]

Competition law issues will be further considered in section 2.7.6 below.

Given the focus of this study is on capital city wholesale and retail petrol markets, the competition issues concerning country wholesale and retail petrol markets will not be further considered.

2.7.5 Political Response to Pricing and Competition Issues

General consumer dissatisfaction with the setting of wholesale and retail petrol prices as well as concerns expressed by retailers regarding the conduct of the oil majors has prompted a series of inquiries and reports by Commonwealth and state government agencies, parliamentary committees, as well as other organisations. It is estimated that there have been at least 46 inquiries into various aspects of the downstream petroleum industry since 1983. Furthermore, a Royal Commission investigated the downstream petroleum industry during the mid-1970s in addition to several inquiries into petrol pricing by the PJT prior to 1983. The level of scrutiny as well as the accompanying regulation imposed on the downstream petroleum industry prompted Starkey (AIP) to observe in 1996 that:

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[121] *Australian Competition and Consumer Commission v Leahy Petroleum Pty Ltd & others (Geelong)*

[122] Australian Competition and Consumer Commission (2007) Geelong petrol decision 'disappointing'. *Media Release*, 29 May.

> the industry is subject to more scrutiny and investigation and more detailed economic regulation than any other industry.[123]

Arguably, the imposition of price regulation at both the Commonwealth and state government level was an attempt to address concerns expressed by motoring consumers in relation to perceived anti-competitive conduct in retail petrol markets as well as concerns expressed by retailers regarding unfair wholesale prices. Similarly, the enactment of the Sites Act and the Franchise Act was arguably an attempt to alleviate concerns expressed by retailers at their perceived unfair treatment at the hands of the oil majors.

In addition, there have been three main policy reactions within the Australian political system in response to concerns expressed regarding possible predatory conduct and price discrimination. The first was through the prohibition on price discrimination contained in the Franchise Act, although this seems to have proven ineffective in terms of mitigating the concerns of franchisees.

The second has been attempts to break the tied supply arrangements between franchisees from their oil major franchisors. In the early 1980s, state governments in Victoria and Western Australia introduced legislation allowing branded retailers to source up to 50 per cent of their supply needs from non-branded suppliers. However, the effectiveness of such legislation was struck down when the oil majors mounted a successful prosecution for *passing off*, the practice of selling a brand of petrol inconsistent with what is

[123] Starkey, J., *op.cit.*, p. 381.

advertised on the petrol bowser.[124] An attempt to enable franchisees to source up to 50 per cent of their fuel supplies from a party other than their franchisor was resurrected through a private members bill introduced into the Commonwealth Parliament in 1999.

The third policy reaction has been the mandating of wholesale price transparency. The Victorian Government has introduced provisions mandating that declared suppliers of petrol had to set a terminal gate price with the aim of increasing the transparency of pricing and to provide access to product at terminals at competitive wholesale prices for all distributors and retailers.[125] The *Petroleum Products (Terminal Gate Pricing) Act 2000* was passed by the Victorian Parliament on 15 November 2000 and came into operation on 1 August 2001. The legislation requires declared suppliers to set a terminal gate price for the sale or supply of declared petroleum products to wholesalers, distributors and retailers. This terminal gate price is the base price at which declared petroleum products are first sold into the wholesale market in Victoria.

Under the Petroleum Products Act, the terminal gate price is determined by adding together:

- The landed international product price;
- Excise and other taxes payable by a declared supplier;

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[124] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 43.
[125] Australian Competition and Consumer Commission (2002) *Terminal gate pricing arrangements in Australia and other fuel pricing arrangements in Western Australia.* Canberra, p. 4.

- A margin which represents a reasonable cost for establishing and operating a terminal; and

- GST on the total amount.

The Petroleum Products Act places several requirements on the declared suppliers of declared petroleum products which are:

- Declared suppliers must publicly advertise a terminal gate price for declared petroleum products and may only change it once in 24 hours.

- Contracts between suppliers and distributors or retailers will be based on the terminal gate price plus additional services, less discounts or rebates.

    - The Petroleum Products Act applies to contracts and (contract renewals) entered into after 1 August 2001.

    - Contracts entered into between 1 November 2000 and 1 August 2001 become void to the extent that they are inconsistent with the Petroleum Products Act. However, the contract otherwise remains in force.

    - Contracts entered into before 1 November 2000 are not required to be in line with the Petroleum Products Act.

- Invoices must identify the terminal gate price plus the price of additional services that relate to the load, less discounts or rebates.

- Declared suppliers must make their optional service charges and any return on investment in leased sites available on request to resellers and leaseholders respectively.

- Declared suppliers must provide access to product from the terminal at the terminal gate price. Access can only be denied in specified circumstances.[126]

Probably in an attempt to thwart a similar legislative response in other parts of the country and nationally, the oil majors have also introduced their own voluntary terminal gate pricing arrangements. In February 2002, Shell introduced terminal gate pricing arrangements in all states and the Northern Territory, except in Victoria and Western Australia.[127] Similarly, Caltex introduced terminal gate pricing arrangements in May 2002 in the same states as Shell and the Northern Territory.[128] BP introduced terminal gate pricing arrangements in June 2002 in Adelaide, Brisbane and Sydney.[129] In December 2002 the Western Australian Government introduced a similar terminal gate pricing system in Western Australia to that operating in Victoria, replacing its maximum wholesale price arrangements.

The Commonwealth Government implemented a national terminal gate pricing regime mandating price transparency at the terminal gate throughout Australia as part of the new Oilcode code of conduct for the downstream petroleum industry that came into operation on 1 March 2007. The Commonwealth Treasury has argued that the Commonwealth Government's

[126] *ibid.*, p. 51.
[127] *ibid.*, p. 5.
[128] *ibid.*, p. 5.
[129] *ibid.*, p. 5.

terminal gate pricing arrangements are not as prescriptive as the Victorian and Western Australia arrangements and will ensure that customers have the flexibility to negotiate individual supply agreements.[130]

2.7.6 Competition Issues and Law Enforcement

Competition within Australian markets is regulated by the competitive conduct provisions of the TPA contained in Part IV. Part IV prohibits corporations from engaging in certain types of anti-competitive conduct described below in broad terms:[131]

- Agreements which have the purpose or likely effect of substantially lessening competition in a market are prohibited under section 45.

- Agreements between competitors which have the purpose of restricting the supply or acquisition of goods or services from particular persons or classes of persons, known as an exclusionary provision or primary boycott, are subject to a *per se* prohibition under section 45.

- Agreements that fix prices are subject to a *per se* prohibition under section 45A.

- Section 46 prohibits a corporation with a substantial degree of market power from taking advantage of that power for the purpose of eliminating or substantially damaging a competitor, preventing market entry, or deterring or preventing a person from engaging in competitive conduct.

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[130] Commonwealth Treasury (2006) *Australian Treasury Submission to the Inquiry into the Price of Petrol in Australia.* Canberra, p. 18.

[131] There is also equivalent state and territory legislation that prohibits the same types of conduct engaged in by non-corporations.

- Section 47 prohibits exclusive dealing that has the purpose or effect of substantially lessening competition in a relevant market. A particular form of exclusive dealing, known as third line forcing which involves the supply of goods or services on conditions that the purchaser acquire goods or services from a particular third party, is subject to a *per se* prohibition.

- Section 48 is a *per se* prohibition against resale price maintenance which is the practice of specifying a minimum price below which goods or services may not be resold or advertised for resale.

- Section 50 prohibits mergers or acquisitions which would have the effect or likely effect of substantially lessening competition in a substantial market for goods or services within Australia.

Responsibility for the administration and enforcement of Part IV resides with the ACCC (and previously with the TPC).

Under the authorisation and notification provisions contained in Part VII of the TPA, the ACCC has the power to grant immunity from legal proceedings for some arrangements or conduct that might otherwise be in breach of Part IV. In order to be granted authorisation, applicants must satisfy one of two tests depending on the conduct under consideration:

- For agreements that may substantially lessen competition, the applicant must satisfy the ACCC that the agreement results in a benefit to the public that outweighs any anti-competitive effect.[132]

- For primary and secondary boycotts, third line forcing, resale price maintenance and mergers, the applicants must satisfy the ACCC that the conduct results in a benefit to the public such that it should be allowed to occur.[133]

Exclusive dealing conduct (except for third line forcing) gains immediate and automatic immunity from legal proceedings under the TPA when notification of it is given to the ACCC.[134] Immunity for third line forcing comes into effect at the end of a prescribed period from the time the ACCC receives the notice.[135] The immunity for notification remains unless it is revoked by the ACCC.

In its administration and enforcement of Part IV of the TPA, the ACCC, and its predecessor, the TPC, have had a long and active history of engagement in the affairs of the downstream petroleum industry. The ACCC/TPC have litigated numerous matters involving the downstream petroleum industry for possible breaches of Part IV of the TPA, mostly for price fixing and resale price maintenance, with mixed success as illustrated in section 2.7.4 above.

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[132] Australian Competition and Consumer Commission (2003) *Summary of the Trade Practices Act 1974 – and additional responsibilities of the Australian Competition and Consumer Commission under other legislation.* Seventh Edition, Canberra, p. 56.
[133] *ibid.*, p. 56.
[134] *ibid.*, p. 57.
[135] *ibid.*, p. 57.

In the latter half of 1990 the TPC alleged that petrol retailers in the Sydney metropolitan area had made an arrangement or arrived at an understanding with each other and with the Service Station Association (a New South Wales lobby group for petrol retailers affiliated to the MTAA) to fix, control or maintain prices, in breach of section 45 and 45A of the TPA.[136] However, the action was dismissed in the Federal Court on the basis that the evidence did not justify a finding that the arrangement or understanding alleged in fact occurred.

In 1994 the TPC/ACCC instituted proceedings against Mobil, BP and Shell for allegedly colluding with each other on setting retail petrol prices.[137] In this matter the ACCC alleged that from September 1991 to June 1992 that Mobil, BP and Shell had conveyed to each other information concerning proposed or anticipated petrol price changes at Melbourne and Sydney commission agent retail service station sites. The ACCC contended that the companies concerned would all increase their prices on receipt of this information. However, the Federal Court dismissed the claim in 1997 on the basis that the evidence presented of conversations didn't support a price fixing arrangement.

In addition to litigation, the ACCC/TPC has also had other interactions with the downstream petroleum industry. The ACCC/TPC have scrutinised several mergers and acquisitions within the downstream petroleum industry for their compliance with section 50. In one of the most high profile merger

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[136] *Trade Practices Commission v Service Station Association Ltd and Others* (1992) 109 ALR 465.
[137] *Australian Competition and Consumer Commission v Mobil Oil Australia and Ors* (1997) ATPR ¶41-568.

cases of all time, the TPC sought court enforceable undertakings under section 87B of the TPA from the parties for not opposing the 1995 merger between Ampol and Caltex. Another example of ACCC involvement in the downstream petroleum industry is through the shopper docket schemes operated by Woolworths and Coles, which tie petrol discounts to grocery purchases, that are subject to notification for third line forcing.

If REAs had an anti-competitive purpose and/or effect, their legality could have been challenged under section 45. If section 45 had contained a *per se* prohibition against all horizontal agreements between market competitors then REAs would have been illegal. The 1993 Hilmer report into National Competition Policy considered the policy question as to whether all horizontal agreements between market rivals should be subject to a *per se* prohibition and rejected it on the grounds that a *per se* prohibition on all agreements between competitors would catch much economically efficient conduct.[138]

In a blaze of publicity, the ACCC raided 11 locations in Victoria and New South Wales, including the offices of Shell, Mobil and Caltex in April 2002 following allegations of price fixing by a whistleblower. This investigation was later dropped by the ACCC in March 2003. A major issue considered by the TPA Review Committee established in 2002 were complaints that "the ACCC released information and made comments to the media that was neither balanced nor impartial and carried with it the danger that the corporation or individual involved might be denied procedural fairness in

[138] Hilmer, F. G., Rayner, M. R. and Taperell, G. Q. (1993) *National Competition Policy: Report by the Independent Committee of Inquiry*. AGPS, Canberra, p. 48.

proceedings yet to be determined", conduct that has been labelled as *trial by media.*[139] All four oil majors made submissions to the 2002 Trade Practices Act Review Committee outlining their concerns that the ACCC engaged in trial by media.

The ACCC rejected accusations it engaged in trial by media, asserting there was no basis for such claims.[140] Further, the ACCC asserted that if oil companies had a bad reputation with the public, then this was the fault of the oil companies rather than the fault of the ACCC.[141]

The 2003 report of the TPA Review Committee (Dawson report) recommended the ACCC should develop a media code of conduct in consultation with interested parties to govern its use of the media, particularly in relation to enforcement proceedings.[142] Under this media code of conduct, the Dawson report further recommended the ACCC should: decline to comment on investigations; only comment on the commencement of court proceeding by way of a formal media release confined to stating the facts; and report the outcome of court proceedings in an accurate, balanced and consistent manner with the sole objective of ensuring public understanding of the court's decision.[143]

Based on a lengthy period of competition law enforcement activity, perceptions by motoring consumers of anti-competitive conduct existing within the downstream oil industry are probably not totally without

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[139] Dawson, D., Segal, J. and Rendall, C. (2003) *Review of the Competition Provisions of the Trade Practices Act.* Canberra, p. 182.
[140] Fels, A. (2002) *The Review of the Trade Practices Act and issues concerning the ACCC and the media.* Speech to the National Press Club, Canberra, 31 July.
[141] *ibid.*
[142] Dawson, D., Segal, J. and Rendall, C., *op.cit.*, p. 189.
[143] *ibid.*, p. 190.

foundation. Posner has observed that in a market where collusion is attractive there will be a history of attempts at express collusion, some of which may have been detected by competition law authorities.[144] On this basis, Posner argues that an industry's compliance with competition law provides some evidence as to whether the prevailing market structure of an industry is conducive to collusion and/or anti-competitive conduct.[145] On the basis of Posner's reasoning, the downstream petroleum industry is certainly vulnerable to collusion and anti-competitive conduct. An examination of what factors could make an industry vulnerable to collusive conduct is provided in Chapter 3.

2.7.7 Fuel Standards

New fuel specifications introduced on either a regional or national level have the potential to raise barriers to entry into wholesale markets thereby reducing the level of contestability and thus competition in the affected markets. This is particularly so if new fuel specifications are unique and align with the production capabilities of a local refiner or refiners.[146] Such fuel specifications offer local refiners a degree of protection from imports from interstate as well as from overseas, and may require fuel to be specially produced to meet unique state-specifications which are likely to add to production costs.[147]

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[144] Posner, R. (1976) *Antitrust Law: An Economic Approach*. The University of Chicago Press, Chicago, p. 61.
[145] It should be noted that Posner draws no distinction between tacit collusion and overt collusion, and has contended that tacit collusion should be subject to sanction under competition law along with overt collusion.
[146] Department of the Environment and Heritage (2000) *National Fuel Quality Standards: Regulation Impact Statement*. Canberra.
[147] *ibid.*

The impact arising from new fuel quality standards was described by the Department of Industry, Tourism and Resources in the following terms:

> Tighter or differing fuel quality standards applying in some jurisdictions have enabled higher relative values to be ascribed to product that meet these specific requirements.[148]

The Queensland, Western Australian and South Australian Governments' legislated to enact state specific fuel specifications, thereby reducing the contestability of their wholesale markets to fuel sourced from outside of their state. Similarly, the Commonwealth Government implemented a clean fuel agenda for petrol and diesel, the first part of which was announced in July 2001 and the second part announced in July 2004. These standards will be introduced progressively between 2002 and 2009.

In August 1999, the Western Australian Government announced new fuel specifications to apply in Western Australia to reduce the level of benzene and MTBE in petrol as from 1 January 2000.[149]

After BP decided not to renew REAs in regard to its Kwinana refinery near Perth, Shell asserted that the new fuel specifications put BP in a monopoly supply situation in Western Australia and accused BP of taking advantage of this situation in order to raise its prices to supply competitors.[150] According to Shell:

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[148] Department of Industry, Tourism and Resources, *Downstream Petroleum Industry Framework 2002*, p. 22.
[149] Court, R. (1999) Details of new fuel specification standards for Perth outlined. *Media Release*, Western Australian Premier, Minister for Public Sector Managements, and Federal Affairs, 2 August.
[150] The Shell Company of Australia Limited (2001) Unique Fuel Quality Specifications Causes Higher Petrol Prices. *Media Release*, 31 December.

> Petrol prices will increase in Western Australia from January 1 as a result of price increases imposed by the local BP refinery on all its customers.
>
> Shell spokesperson Ian McKenzie said "the reason for these price increases is that Western Australia has legislated unique fuel standards that differ from anywhere else in the world. Although the local BP refinery can manufacture petrol to this standard, most refineries in the Asia-Pacific region cannot."
>
> "This effectively places the local BP refinery in a monopoly situation. It is now very difficult to source reasonably priced imports to supply the WA market."
>
> "Shell's cost of petrol is now 1.9 cents per litre higher in Perth than in other major cities as a direct result of the quality premium charged by BP. This quality premium is expected to increase over time."[151]

BP wrote to the other Australian refiners in October 2001 informing them that it was withdrawing from the existing REAs as from the beginning of July 2002.[152] As from 1 January 2002, BP required the other three refiners in Shell, Caltex and Mobil to pay a quality premium for the remaining 20 to 30 per cent of their product requirements in Western Australia not covered through REAs.[153] From 1 July 2002, BP would require all retailers to buy 100 per cent of their product requirements from BP at the same formula.[154]

According to the Western Australian Government, all unleaded petrol supplied from the BP Kwinana refinery (after the replacement of REAs with

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[151] *ibid.*
[152] *Platts Oilgram News* (2001) BP Roils Australia's Fuel Exchange Program. 9 November: 1.
[153] *Platts Oilgram News* (2001) BP Maps End of Australian Fuel Swaps: Wants rivals to buy 20-30% of product at Jan 1. 3 December: 2.
[154] *Platts Commodity News* (2001) BP Australia to terminate refinery exchange July 2002. 30 November: 22.

commercial buy-sell arrangements across Australia as from 1 July 2002) attracted a *quality premium* of approximately 1.7 cpl as a result of the Western Australian fuel quality standards, rising to 1.85 to 1.90 cpl after the impact of the GST was applied.[155]

Similar to Western Australia, the Queensland Government in February 2000 announced new fuel specifications to reduce the amount of sulphur in petrol.[156] The former independent fuel retailer Woolworths (before it entered into its joint retailing venture with Caltex) opined in 2001 that the independent importing terminal operating in Brisbane had been rendered ineffective due to the Queensland Government's restrictive fuel standards.[157] Similarly, the Chairman of the Independent Petroleum Group commented in 2005 that restrictive fuel standards introduced in Queensland had imposed a penalty on importing that had added to the retail price of petrol.[158]

On 1 March 2001, the South Australian Government enacted new environmental fuel standards.[159] In response, Shell was scathing in its assessment of the new environmental fuel standards, claiming that it would

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[155] Government of Western Australia (2004) *Final Progress Report: Implementing National Competition Policy in Western Australia*. Perth, p. 59.
[156] Welford, R. (2000) Boost For Air Quality From Government Fuel Initiative. *Media Release*, Queensland Environment and Heritage/Natural Resources Minister, 7 February.
[157] Woolworths Limited (2001) *Submission to Australian Competition and Consumer Commission on: Reducing Fuel Price Variability*. Sydney.
[158] *Impact of Petrol Pricing Select Committee* (2005) Transcript of Proceedings at Yeronga on Monday, 28 November 2005, at 9.31am. Queensland Parliament, Brisbane, pp. 1-3.
[159] Evans, I. (2001) Clean Fuel Policy Starts Today. *Media Release*, South Australian Environment Minister, 1 March.

lead to higher petrol prices in South Australia than was the case in the rest of the country.[160] According to Shell:

> Until yesterday, the South Australian fuel market could be supplied by a wide range of domestic and international refineries. Yesterday's intervention by the South Australian Government has changed local fuel quality specifications so that only the Mobil Port Stanvac refinery can cost effectively supply local needs.
>
> This substantially reduces competition from interstate and overseas refineries. Mobil has responded by increasing its refinery price for fuel, even though the fuel quality has not changed. Shipping fuel into Adelaide from alternative sources could cost up to five cents per litre more.
>
> This means that our customers in South Australia will ultimately pay more for their petrol.[161]

Caltex was also critical of the new fuel specifications, claiming that it had made Mobil "a monopoly supplier".[162] Shortly after the new fuel specifications were introduced, the Royal Automobile Association of South Australia claimed that the policy had resulted in an increase of retail petrol prices by 2 cpl, which would equate to an extra $20 million out of the pockets of South Australian motorists each year.[163]

In July 2001, the Commonwealth Government announced the first part of new national fuel standards. Possibly the most significant change associated with these new national fuel standards was the limit imposed on the amount of MTBE and olefins allowed in petrol that came into effect as from 1

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[160] The Shell Company of Australia Limited (2001) Petrol Prices Fall Except in South Australia. *Media Release*, 2 March.
[161] *ibid.*
[162] *The Australian* (2001) Shell jobs fear over clean fuel. 6 March: 7.
[163] *The Advertiser* (2001) Clean fuel 'costing us 2c a litre. 10 March: 13.

January 2004.[164] While domestic refiners had phased out the use of MTBE, it was still commonly used in Asian refineries. According to news reports, only five out of forty refineries focusing on producing petrol in Asia and the Arab Gulf were able to meet the new Australian specification.[165]

Independent fuel wholesalers and retailers vigorously opposed the Commonwealth Government's proposed new fuel specifications, arguing that it would leave Australian wholesale petrol markets solely dependent on the four domestic refiners for supply of product, thus leading to a diminution in the level of competition. According to former independent petrol retailer Woolworths, the consequences from banning MTBE in Australia petrol would have dire ramifications for competition:

> If fuel containing MTBE was banned in Australia, the existing competition provided by [Woolworths] and other independent fuel outlets would disappear. This would return the market solely to the 4 major multi-national oil companies, resulting in a severe lessening of competition from independents and petrol prices would rise significantly thus increasing cost to the motorist and businesses.[166]

News reports also suggested that petrol cargoes exported to Australia would be trading at a premium once the new Australian fuel specifications came into effect. Whereas petrol cargoes had traditionally been traded at a slight discount to the MOPS 95 RON[167] specification, there were predictions that

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[164] Hill, R. (2001) Hill Announces National Fuel Standards. *Media Release*, Australian Government Minister for the Environment and Heritage, 15 July.
[165] *Platts Commodity News* (2003) Australia's gasoline imports to trade at premium due to new specs. 8 December.
[166] Woolworth Limited (2002) Woolworths Plus Petrol and MTBE. http://www.woolworthlimited.com.au/news/factsheets/publicdocuments/18-01-2002_a [Accessed 14 February 2005]
[167] MOPS is an acronym which stands for *Mean of Platts Singapore* and RON is an acronym which stands for *Research Octane Number*.

petrol exported into the east coast of Australia would be trading at a premium of $0.20 to $0.30 a barrel to the MOPS 95 RON specification as a result of the new Australian fuel specifications.[168]

In response to claims by Consumers Affairs Victoria (CAV) that wholesale petrol price margins had increased by at least 2.5 cpl between January 2003 and April 2006, the AIP claimed that the CAV analysis did not take account of the more stringent Australian fuel quality standards. According to the AIP:

> If the price effect of tougher fuel standards were taken into account it would be evident that wholesale margins have not increased since 2003.[169]

Similarly, Caltex opined that tougher fuel standards had increased its relative wholesale petrol price by about 2.5 cpl since 2003.[170]

The decision by the Commonwealth Government to limit the amount of MTBE and olefins in petrol from the beginning of 2004, may have made Australian domestic wholesale petrol markets less contestable to imported sources of petrol, which has probably resulted in relatively higher wholesale and retail petrol prices.

2.8 Conclusion

The affairs of the downstream petroleum industry are a matter of longstanding public controversy in Australia. This controversy has arguably

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[168] *Platts Commodity News* (2003) Australia's gasoline imports to trade at premium due to new specs. 8 December.
[169] Australian Institute of Petroleum (2006) Oil companies wholesale margins have not increased – CAV report flawed. *Media Release*, 25 July.
[170] Caltex Australia Limited, *op.cit.*, p. 8.

been a direct cause for the numerous regulatory interventions as well as investigations into the industry. In addition, the setting of retail petrol prices is a matter of considerable public interest, drawing commentary and reflections from political leaders and motoring organisations alike.

The observation that petrol is a homogeneous product lends itself to the conclusion that price must be the main basis on which competition occurs within the Australian downstream petroleum industry. This conclusion will enable the competitive effects of REAs to be tested through their impact on petrol prices that will be undertaken in Chapter 6.

Chapter 3: Market Power

3.1 Introduction

Following on from Lerner, market power has commonly been defined as the ability for a firm to profitably raise the product price above its marginal cost.[171] This Chapter will focus on market power issues relevant to the downstream petroleum industry.

Due to the restrictions imposed on the oil majors through the Sites Act there has been a high degree of vertical separation of the distribution and wholesaling level from the retailing level within the Australian downstream petroleum industry. In this Chapter the academic literature pertaining to vertical price relationships within the downstream petroleum industry will be examined. In Chapter 2, an apparent anomaly was identified with claims of price fixing and collusion often made against oil companies by politicians and motoring organisations appearing to be inconsistent and contradictory with claims of predatory pricing made by service station operators. The first part of this Chapter will explore this apparent anomaly and seek to provide a possible explanation for it. The explanation for this apparent anomaly will provide the theoretical underpinnings for the hypothesis testing carried out later in the study.

At the refining level as well as the distribution and wholesaling level the Australian downstream petroleum industry could be considered to be an oligopoly. This opinion has been expressed by Access Economics and Rose

[171] Lerner, A. P. (1934) The Concept of Monopoly and the Measurement of Monopoly Power. *The Review of Economic Studies* 1, 157-175.

and is consistent with the views of Walker and Woodward.[172] Given this, an examination of oligopoly theory will assist in the consideration of whether REAs have an anti-competitive effect. Hence, the second part of this Chapter will also provide a review of the theoretical literature pertaining to oligopoly and the problem posed by the interdependency of market participants. In particular, it will focus on those conditions identified in the theoretical literature as likely to be conducive for rival firms to behave in a co-operative manner towards one another, thus leading to tacit collusion and an anti-competitive outcome.

3.2 Vertical Pricing Issues

The Sites Act imposed a high degree of vertical separation between the distribution and wholesaling level and the retailing level within the Australian downstream petroleum industry. However, the ACCC opined that the oil majors used contractual arrangements with franchisees in order to circumvent the intent of the Sites Act, resulting in effective *de facto* vertical integration. According to the ACCC:

> effective vertical integration is achieved through a number of vertical arrangements, such as restrictive contracts, exclusive supply agreements and multi-site franchising, that ensure constancy of demand through exclusive ties to one oil major.[173]

While the oil majors may have been able to exercise considerable control over their franchisees through contractual arrangements, the prohibition on retail price maintenance contained in section 48 of the TPA prevented the

[172] See: Access Economics, *op.cit.*, p. 8; Rose, J. (1999) The ACCC and the Market Power of the Oil Majors – Part 1. *Trade Practices Law Journal* 7, 17-30, p. 18; Walker, J. and Woodward, L., *op.cit.*, p. 33.
[173] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 119.

oil majors from exercising direct control over the price of petrol sold by their franchisees as well as from oil major branded dealer-owned sites. If Williamson is correct in his contention that vertical integration harmonises interests or reconciles differences between different functional levels within an industry, then the degree of vertical separation afforded to oil major franchisees and branded dealer-owned sites that enabled them to exercise a high degree of discretion in setting the retail petrol price may have created a potential source of conflict with their oil major franchisor/oil major supplier.[174] Hart and Tirole have observed that "integration removes conflicts of interest about pricing".[175]

The long history of disputation between the oil majors and their franchisees that was outlined in Chapter 2 would suggest that the interests of oil majors and their franchisees have not been closely aligned. One potential source of conflict between oil majors and their service station operators in franchisees and dealer-owned sites could be over the retail petrol price which could have implications for the exercise of market power.

Complaints from organisations representing service station operators about the retail pricing practices of the oil majors amounting to predatory pricing within the Australian downstream petroleum industry have become commonplace. Debate has raged over an exact definition of what conduct actually constitutes predatory pricing. According to Crane, the definition of

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[174] Williamson, O. (1971) The Vertical Integration of Production: Market Failure Considerations. *The American Economic Review* 61, 112-123, p. 117.
[175] Hart, O., Tirole, J. (1990) Vertical Integration and Market Foreclosure. *Brookings Papers on Economic Activity*, Microeconomics (1990), 205-276, p. 207.

predatory pricing and its elements has long been, and continues to be, debated by the brightest economic and legal minds.[176]

Yamey has observed that predatory pricing has been commonly defined as temporary selling, at prices below its costs, by a firm (or concerted group of firms) to drive out or crush a competitor.[177] Areeda and Turner have defined predatory pricing as "the deliberate sacrifice of present revenues for the purpose of driving rivals out of the market and then recouping the losses through higher profits earned in the absence of competition.[178] According to Areeda and Turner, predatory pricing would make little economic sense to a firm unless it possessed greater financial resources than its rivals and had a very high probability that the losses incurred in the predatory campaign would be exceeded by the profits to be earned after the rivals had been removed from the market.[179]

Organisations representing service station operators have contended that the oil majors have embarked on a deliberate strategy of predatory pricing in order to force small business service station operators to exit the retail market. According to the PMAA:

> The retail petroleum industry is unique in that it is the only industry where small business participants must directly compete with their own petroleum suppliers.

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[176] Crane, D. A. (2006) The Perverse Effects of Predatory Pricing Law. *Regulation* Winter 2005/2006, 26-31, p. 28.
[177] Yamey, B. S., *op.cit.*, p. 129.
[178] Areeda, P. and Turner, D. F. (1975) Predatory Pricing and Related Practices under Section 2 of the Sherman Act. *Harvard Law Review* 88, 697-733, p. 698.
[179] *ibid.*, p. 698.

> As a result, manipulation and predatory behaviour in this unique industry is commonplace.[180]

The MTAA has commented that it has "been concerned for many years about predatory behaviour" in retail petrol markets.[181]

Once small business service station operators have been removed, it is maintained that the oil majors will be able to raise their retail prices to consumers as a consequence of diminished competition within retail petrol markets. According to the PMAA:

> The major oil companies are able to sell petrol at a retail price lower than the wholesale price offered to other market participants. The result of this activity is that there are two wholesale prices, one for the passport holders of the oil companies, and one for the rest of the market. This practice is eliminating small businesses from this market. We believe this action is planned and deliberate. The long-term benefits for the oil companies are incalculable. In contrast, the long-term costs for the Australian consumer will be horrific.[182]

Similarly, the MTAA has opined in regard to retail petrol prices that:

> MTAA strongly believes that a greater number and diversity of competitors is more likely to encourage retail price competition than a smaller number of highly vertically integrated larger competitors.[183]

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[180] Independent Petroleum Marketers Association of Australia, *op.cit.*, p. 5.
[181] Motor Trades Association of Australia (2007) MTAA Welcomes Moves to Examine Petrol Pricing. *Media Release*, 15 June.
[182] Independent Petroleum Marketers Association of Australia (2001) *Response to Australian Competition & Consumer Commission Reducing Fuel Variability Discussion Paper*. Melbourne, p. 2.
[183] Motor Trades Association of Australia (2006) *Submission to the Senate Economics Legislation Committee Inquiry into the price of petrol in Australia.* Canberra, p. 6.

Concerns expressed by organisations representing retail service station operators that the oil majors are engaging in predatory pricing in order to drive them from the retail market so they can raise retail prices after their departure are not unique to Australia. Similar concerns have been raised in the United States regarding the conduct of vertically integrated oil refiners. Barron, Loewenstein and Umbeck observe that allegations of predatory pricing by large oil refiners have been made repeatedly by retail dealers' representatives who have advocated retail divorcement as a solution.[184]

Blass and Carlton observe that proponents of divorcement as well as those seeking other restraints have argued that vertically integrated oil refiners can and have driven their dealers out of business.[185] According to Blass and Carlton:

> One dominant theme is that the major oil companies discriminate against their own retail dealers by charging them too much for [petrol] either relative to the prices charged to independent wholesalers or relative to the retail prices set by company-operated stations...
>
> Once retail competition from lessee dealers is eliminated, the company operations will harm consumers by raising prices. Critics conclude that only by imposing restrictions on the majors, specifically by preventing them from operating their own stations, can these predatory practices be curtailed, thereby enhancing consumer welfare in the long run.[186]

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[184] Barron, J. M., Loewenstein, M. A. and Umbeck, J. R. (1985) Predatory Pricing: The Case of the Retail Gasoline Market. *Contemporary Policy Issues* 3, 131-139, p. 131.
[185] Blass, A. A. and Carlton, D. W. (2001) The Choice of Organisational Form in Gasoline Retailing and the Cost of Laws that Limit that Choice. *Journal of Law and Economics* XLIV, 511-524, p. 521.
[186] *ibid.*, pp. 521-522.

Claims regarding predatory pricing have commonly been cited as one of the main competition concerns arising from vertical integration. According to McGee and Bassett, it has often been contended that vertically integrated firms are able to engage in price squeezes which occur when a vertically integrated firm that faces competition at one level, reduces the spread between the input prices its competitors pay and the output prices they receive.[187] On the other hand, Bork has argued that vertical integration does not confer any unique ability on firms to engage in a price squeeze as a monopolising technique.[188] Bork has argued that a price squeeze is nothing more than a price-cutting campaign at one level, and that a nonintegrated firm can just as easily engage in this sort of conduct as the second level of a vertically integrated firm.[189] Similarly, Demsetz has opined that there is little theory to support the notion that vertical integration reduces competition substantially and that the presumption of vertical integration being associated with market foreclosure is highly speculative.[190]

Claims of predatory pricing within the downstream petroleum industry are not new. It was widely believed that the Standard Oil Company used predatory pricing as a monopolisation technique in order to obtain its dominance over the US downstream petroleum industry in latter part of the 19th century and early part of the 20th century. According to Crane:

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[187] McGee, J. S. and Bassett, L. R. (1976) Vertical Integration Revisited. *Journal of Law and Economics* 19, 17-38, p. 21.
[188] Bork, R. (1954) Vertical Integration and the Sherman Act: The Legal History of an Economic Misconception. *University of Chicago Law Review* 22, 157-201, pp. 198-199.
[189] *ibid.*, p. 199.
[190] Demsetz, H. (1992) How Many Cheers for Antitrust's 100 Years? *Economic Inquiry* 30, 207-217, pp. 215-216.

> Among the evils attributed to ... Standard Oil was underpricing rivals to maintain a monopoly in oil production.[191]

McGee observes that the largest number of complaints regarding the price cutting conduct of the Standard Oil Company came from petroleum product wholesalers and retailers (who were selling kerosene at that time).[192] However, McGee dismisses claims that the Standard Oil Company ever sought to obtain a monopoly over retailing on the basis that it was less logical and less consistent with the available facts.[193] Through its dominance over the refining sector, McGee contends it was in the interests of the Standard Oil Company to keep the retailing sector as efficient and highly competitive as possible and exercise any market power at the refining level.[194] According to McGee, the Standard Oil Company evidently concluded that its interests could usually best be served by letting someone else perform the retailing function.[195]

Where the possession of market power is profitable for a firm, McGee opines that it is far easier to obtain market power through acquisition rather than engage in predatory pricing unless there are legal restraints preventing acquisition. This is because in order to undercut rival firms on price to lure customers away from those rivals, a firm must be prepared to service all customers. On this basis, McGee concludes that any firm engaging in

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[191] Crane, D. A., *op.cit.*, p. 26.
[192] McGee, J. S. (1958) Predatory Price Cutting: The Standard Oil (N.J.) Case. *Journal of Law and Economics* 1, 137-169, p. 157.
[193] *ibid.*, p. 160.
[194] *ibid.*, p. 160.
[195] *ibid.*, pp. 160-161.

predatory pricing as a means to obtain market power will end up selling more, and therefore losing more, than their rivals.[196]

While McGee concedes that it is conceivable that a firm may engage in predatory pricing to secure market power, he expresses scepticism that it would pay the firm to do so since acquisition is both cheaper and more reliable.[197] Furthermore, where entry into a market is quick and relatively easy McGee contends that it would be foolish to try to obtain market power through predatory pricing.[198]

However, Posner contends that McGee's proposition that acquisition is a more effective avenue to obtain market power than predatory pricing is valid only if mergers are assumed to be legal.[199] Posner points out that given mergers designed to create market power have generally been rendered illegal and given the difficulty of establishing predatory pricing even if it is illegal, predatory pricing may in fact still be a cheaper means of achieving market power than acquisition.[200] In the Australian context, the operation of the Sites Act has probably been the major obstacle preventing the oil majors from becoming fully vertically integrated.

Posner points out that predatory pricing is an exclusionary practice that requires the cooperation of the customer to succeed.[201] In this instance, Posner observes that customers may not be sufficiently informed or far-sighted to realise the cost of taking advantage of the temporarily lower

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[196] *ibid.*, p. 140.
[197] *ibid.*, p. 143.
[198] *ibid.*, p. 142.
[199] Posner, R., *op.cit.*, p. 185.
[200] *ibid.*, p. 185.
[201] *ibid.*, p. 184.

price, or may decide to act as a free rider, taking advantage of the lower price in the hope that the refusal of other customers to do the same will cause the predator's campaign to fail.[202] Overall, Posner arrives at the conclusion that predatory pricing cannot be dismissed as inevitably an irrational practice.[203]

However, scepticism has been expressed regarding claims of predatory pricing within petrol retailing in the United States, with the view expressed that the pursuit of such business strategies are nonsensical. According to Blass and Carlton:

> Although the believability of a predation strategy is always problematic, it is particularly difficult here to understand the economic logic of the predation hypothesis. There is no compelling evidence of retail market power in many, if not most, geographic areas: entry is easy, competitors are numerous, and brand value is not believed to be significant. In such circumstances, there is no reason to expect that an integrated refiner could benefit from driving out its lessee dealers unless lessee dealers are inefficient, and there is no reason to expect consumers to be harmed.[204]

Similarly, Vita has also expressed scepticism regarding predatory pricing in US petrol retailing:

> The theory is difficult to reconcile with economic analysis. Predation normally is thought of as an action taken against a *rival* for the purpose of eliminating that rival competitor. Thus, it is possible to imagine one refiner engaging in predation against another refiner, or a retailer preying upon a rival retailer. But it would make little sense

[202] *ibid.*, pp. 184-185.
[203] *ibid.*, p. 186.
[204] Blass, A. A. and Carlton D. W., *op.cit.*, p. 522.

> for a refiner to prey upon its affiliated retailers. These retailers are not the refiner's competitive constraint; other refiners are. Even a refiner possessing substantial market power has no incentive to drive its efficient dealers out of business – to the contrary, refiner profits will be maximised only when wholesale and retail distribution is efficient.[205]

Barron, Loewenstein and Umbeck tested the hypothesis of whether oil refining company operated retail service station sites in the United States were engaging in predatory pricing directed against other service station retailers in the US state of Maryland.[206] They contended that after retail divorcement laws were passed in Maryland but before they took effect, oil refiners would have no incentive to use company-operated retail service stations to engage in predatory pricing since no potential monopoly profits could be extracted in the future.[207] On this basis, Barron, Loewenstein and Umbeck reasoned that retail petrol prices should rise at oil refining company retail service station sites after the divorcement laws were passed but before they took effect if oil refiners were indeed engaged in predatory pricing. However, they found no evidence in support of predatory pricing in the retail petrol market and concluded that the reported distress of retail service station operators must be due to other factors.[208]

Based on a study of the impact of sales-below-cost laws on retail petrol prices among 40 cities across the United States, Anderson and Johnson concluded that the structure of the retail petrol market did not appear to be

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[205] Vita, M. G. (2000) Regulatory Restrictions on Vertical Integration and Control: The Competitive Impact of Gasoline Divorcement Policies. *Journal of Regulatory Economics* 18, 217-233, pp. 217-218.
[206] Barron, J. M., Loewenstein, M. A. and Umbeck, J. R., *op.cit.*
[207] *ibid.*, p. 132.
[208] *ibid.*, p. 138.

conducive to successful predatory pricing practices and that laws designed to eliminate such practices had resulted in increased prices for consumers.[209]

In 2002, the FTC commented that it had found no evidence that predatory pricing occurs in petrol retailing in the United States:

> Since 1996, the Commission has extensively investigated the pricing practices of virtually every major oil company, and Commission staff have found no convincing evidence of predatory pricing in the retail [petrol] market.[210]

In the Australian context, the Industry Commission cast serious doubt on the ability of the oil majors to successfully engage in predatory pricing against retail service station operators. According to the Industry Commission:

> Even if predatory pricing were successful in fending off a competitor (or a potential competitor), there would be no guarantee that, first, it would be possible to engineer a co-ordinated industry response to raise – and sustain – prices to allow earlier losses to be re-couped and, second, that the higher prices would not attract new entrants which would increase supply and drive prices down again.[211]

Based on its analysis of retail petrol price data from the early 1990s coupled with the risks associated with predatory pricing, the Industry Commission expressed doubt regarding allegations of predatory pricing conduct by the oil majors.

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[209] Anderson, R. W. and Johnson, R. N. (1999) Antitrust and Sales-Below-Cost Laws: The Case of Retail Gasoline. *Review of Industrial Organisation* 14, 189-204, p. 203.
[210] Federal Trade Commission (2002) *Letter to the Honourable Robert F. McDonnell, Commonwealth of Virginia, House of Delegates, Richmond, VA, by the Bureau of Competition and the Office of Planning*. Washington DC, 15 February.
[211] Industry Commission, *op.cit.*, pp. 74-75.

If the oil majors have been engaged in predatory pricing then it appears they have been waiting in vain for a considerable period of time in order to reap the profit windfall gained when all independent retailers have all finally been removed from the retail market. Under these circumstances, it is not unreasonable to conclude that the oil majors have probably not been engaged in predatory pricing and that there could be some other motivating factor to explain the pricing behaviour of the oil majors that is causing concern amongst retail service station operators.

Another possible explanation for the alleged predatory pricing behaviour of oil companies in the United States has been identified by Shepard who has suggested that imperfect competition at the retail level within the downstream petroleum industry can lead to double marginalisation.[212] Double marginalisation, which was identified by Spengler, occurs wherever there is any market power exercised at successive vertical stages of production.[213] If market power is exercised at successive vertical stages of production, for example in petrol at the distribution and wholesale level and the retail level, then the petrol wholesaler will mark up the product in order to make a profit and the petrol retailer will then take the wholesale price and mark it up again. This double mark up on the product leads to lower total sales and lower total profit than if wholesaler and retailer were vertically integrated. An additional mark up at the retail level reduces total sales and profit at the wholesale level. On this basis, Spengler concluded that vertical

[212] Shepard, A., *op.cit.*, p. 427.
[213] Spengler, J. J. (1950) Vertical Integration and Antitrust Policy. *Journal of Political Economy* 58, 347-352.

integration serves to make price structures and factor allocation more ideal than they otherwise would be in an imperfectly competitive world.[214]

Rather than engaging in predatory pricing in order to drive retailers from retail petrol markets, an alternative explanation for the pricing conduct of the oil majors is that they are doing everything in their power to drive the retail petrol price down towards marginal cost in order to maximise profits. If the oil majors want to exercise market power at a wholesale level, then it will be detrimental to their profit maximising interests to have retail service station operators attempting to exercise market power at the retail level as it will result in double marginalisation.

Borenstein and Bushnell have opined that there is some empirical evidence to suggest that double marginalisation is a real concern in the US downstream petroleum industry.[215] According to Borenstein and Bushnell, studies of petrol prices in US states that have divorcement laws that find that retail petrol prices are higher in those states provides anecdotal evidence that double marginalisation occurs in the downstream petroleum industry.[216] Barron and Umbeck found that following the introduction of retail divorcement laws in Maryland which gave retail service station operators the power to set retail petrol prices that retail petrol prices increased.[217] Vita tested the impact of divorcement laws comparing petrol prices in

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[214] *ibid.*, p. 351.
[215] Borenstein, S. and Bushnell, J. (2005) *Retail Policies and Competition in the Gasoline Industry*. Center for the Study of Energy Markets Working Paper 114, University of California Energy Institute, Berkeley, p. 9.
[216] *ibid.*, p. 9.
[217] Barron, J. M. and Umbeck, J. R. (1984) The Effect of Different Contractual Arrangements: The Case of Retail Gasoline Markets. *Journal of Law and Economics* 27, 313-328.

divorcement and nondivorcement US states and found that divorcement regulation increased retail petrol prices.[218]

Given that the Australian downstream petroleum industry is organised along very similar lines to that in the United States, it is possible that double marginalisation could also be an issue for the oil majors which they will seek to prevent. In regard to the Australian downstream petroleum industry, Rose has argued that the oil majors want to avoid any problems arising from double marginalisation:

> The oil majors do not want a retailer/franchisee cartel as an intermediary with the consumer. The oil majors will gain nothing... Market power in a downstream sector would introduce the chain of monopolies problem which is detrimental to the interests of up-stream suppliers as well as consumers. The higher prices charged by colluding dealers and franchisees would reduce demand for the refined product and thus cut the profits of the oil majors.[219]

In order to minimise the prospect of double marginalisation, Rose contends that the oil majors would seek to maximise competition amongst firms operating at the retail level.[220] Rose asserts that the oil majors achieve this outcome through utilising multiple sources of distribution for petrol such as franchisees, company-owned sites, commission agent sites, as well as independents in order to minimise distribution and retailing costs.[221] Through utilising multiple sources of distribution for petrol, Rose observes

[218] Vita, M., *op.cit.*
[219] Rose, J., *op.cit.*, pp. 18-19.
[220] *ibid.*, p. 19.
[221] *ibid.*, p. 19.

that the oil majors are able to prevent their own franchisees from attempting to collude.[222]

Support for the proposition that the price of petrol at the retail level is driven down to marginal cost also comes from Caltex, Shell and BP who all informed the Independent Competition and Regulatory Commission (ICRC) of the Australian Capital Territory in 2001 that retail service stations did not make much profit from selling fuel and often made a loss.[223] Similarly, independent wholesaler Trafigura told the ICRC in 2001 that the lack of profitability was the reason why it was not interested in owning retail service station sites in Australia.[224]

It is in the interests of the oil majors to push the retail price of petrol down to marginal cost in order to avoid double marginalisation and the resulting reduction in sales and profit. The frequent and persistent claims and accusations from organisations representing service station operators that the oil majors are engaging in predatory pricing arguably provides anecdotal evidence that the oil majors are behaving in a manner consistent with preventing double marginalisation through pushing the retail price of petrol down to marginal cost. The concerns expressed by service station operators may reflect dissatisfaction that they are only able to earn a competitive rate of return and are not able to earn any economic profit.[225]

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[222] *ibid.*, p. 19.
[223] Independent Competition and Regulatory Commission (2001) *Final Report: Inquiry into Motor Vehicle Fuel Prices*. Canberra, p. 16.
[224] *ibid.*
[225] If economic profits are zero then a firm is only earning the opportunity cost of its factors of production – the value of the inputs in their next best alternative use.

Rather than engaging in predatory pricing, the oil majors are probably doing everything within their power to ensure that the retail price of petrol is as close to marginal cost as it can possibly get. On this basis, the nature of competition within retail petrol markets would approximate perfect competition where price is equated to marginal cost. The implication of this finding is that retail petrol prices will convey information regarding the oligopolistic interactions of participants in wholesale petrol markets.

3.3 Oligopoly Theory

An oligopoly is a market structure characterised by a few participants. There is no single determinate solution to the problem of oligopoly with many possible outcomes being postulated. The range of solutions runs the full gamut of possible outcomes from that reminiscent of a perfectly competitive market to that of a monopoly.

The reason why there is no single unique solution to the problem posed by oligopoly is because of the interdependency of market participants. For an individual oligopolist the quantity of product which they are capable of selling at any given price is dependent on the price charged by their competitors, which in turn is affected by the price set by the individual oligopolist in the first instance.[226] On this basis, it is not possible for an individual oligopolist to derive a demand function for themselves based only on information pertaining to buyers' preferences.[227] An individual oligopolist also needs to know, in turn, how its competitors will respond to

[226] Fellner, W. (1949) *Competition Among the Few*. Alfred A. Knoff, New York, p. 11.
[227] *ibid.*, p. 11.

the prices they set or the amount of product which they have available to sell.

The early part of the development of oligopoly theory was dominated by debate over the relative merits of alternative solutions for duopoly offered by Cournot as compared to Bertrand and Edgeworth.

The first theory of oligopoly/duopoly is attributed to Cournot.[228] In this model there were two producers of the same product in competition with each other who possessed identical costs of production. The critical behavioural assumption was that each producer would set a level of production independently of the other producer in order to maximise their level of profit, whilst assuming that the production of the other producer would remain constant. Each producer would then keep adjusting their level of production in response to adjustments made by the other producer until such time as an equilibrium position was reached, whereby the production of each producer was equal. Once a stable equilibrium position had been established, if either of the producers departed from it temporarily, they would eventually be brought back to this stable equilibrium position through a series of reactions, constantly declining in amplitude.[229]

The main conclusions reached by Cournot in his treatment of two duopolists competing against each other is that the supply price would be higher than under perfect competition and that a stable equilibrium would prevail, with both duopolists supplying a determinate quantity of product. Although

[228] Cournot, A. (1838) *Research into the Mathematical Principles of the Theory of Wealth.* Translated by Nathaniel T. Bacon, The Macmillan Company, New York.
[229] *ibid.*, p. 81.

Cournot recognised that both producers could increase their respective profits by cutting back on output until it reached the monopoly level, he contended that this would only occur in the event of a formal agreement being struck between the two producers.

Cournot's solution to the problem of duopoly was criticised by Bertrand.[230] Bertrand reinterpreted Cournot's adjustment process between the two producers back to equilibrium as meaning that "one of the competitors will lower his price to attract buyers, and that the other, in order to bring them back, will lower his [price] by more".[231] This process would then continue "until each of them would no longer gain anything more by lowering his price".[232] Bertrand's objection to Cournot's adjustment process was that a solution was impossible to reach through such an arrangement because the price reduction would have no limit. In the event that a jointly determined price was adopted, Bertrand contended that if only one of the producers lowers their price for the product, they will gain all of the sales and double their returns in the event that the other producer allows them to do so. On this basis, Bertrand argued that Cournot's assumption that the level of production is the one independent variable entirely under the control of the producer was wrong, when it was in fact the price. The main conclusion to be drawn from Bertrand is that a stable equilibrium will never exist between two duopolists as there is no limit to the fall in the price of the product.

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[230] Bertrand, J. (1883) Review of 'Theorie mathematique de la richesse social' and 'Recherches sur les principes mathematiques de la theorie des richesses. *Journal des Savants* 67, 499-508, English Translation by James W. Friedman reprinted in Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterization and Applications*. Cambridge University Press, Cambridge, 73-81.
[231] *ibid.*, p. 77.
[232] *ibid.*, p. 77.

Bertrand also criticised Cournot for rejecting the possibility that the two producers may collude and set a common price. According to Bertrand, it would be in the interests of both producers to fix a common price as this would deliver the greatest possible profit.

Similar to Bertrand, Edgeworth contended that when there were two producers dealing with competitive groups, then the equilibrium solution would be indeterminate.[233] Edgeworth maintained that Cournot was incorrect in his conjecture that the action of economic forces amongst two producers "would tend to a definite position of equilibrium, a determinate set of values".[234] According to Edgeworth, this instability was not merely due to the desire of one of the producers to ruin their rival through undercutting them on the supply price to the market, it also arose from one of the producers seeking to maximise their level of profit.

Edgeworth took the model used by Cournot of two producers making an identical product. The major alteration made by Edgeworth to the model was through the imposition of a capacity constraint upon both producers, whereby each producer had a fixed limit as to the amount of product they could supply to the market. Like Cournot, Edgeworth assumed that each producer behaved independently in trying to maximise their own level of profit.

As a starting point, Edgeworth assumed that each producer began by setting a price level that would maximise their profit in the event that the market

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[233] Edgeworth, F. Y. (1897) The Pure Theory of Monopoly. *Giornale degli Economisti*, reprinted in Edgeworth, F. Y. (1925) *Papers Relating to Political Economy*. Macmillan and Co. Limited, London, 111-142.
[234] *ibid.*, p. 136.

was evenly divided up between both producers or that the two producers behaved as if they were acting in combination. At this initial point, Edgeworth argued that it would be in the interests of one of the producers, say *producer 2*, to lower their price by just a little amount so as to attract their rival's customers. Through undercutting *producer 1* by just a little amount and by producing up to their maximum capacity, *producer 2* could increase their level of profit. Although *producer 2* would not be able to supply the entire level of demand at the newly lowered supply price because of their capacity constraint, they would still be able to deprive *producer 1* of a large part of their customer base. However, *producer 1* would then follow suit by setting a still lower price.

Through successive steps of *producer 1* and *producer 2* undercutting each other on the supply price, the price would eventually fall to a level such that neither producer could increase its level of production because the output of both producers was equal to their combined capacity constraint. Although Edgeworth recognised that it was certainly not in the interests of either producer to lower the supply price any further, he maintained that this point did not constitute an equilibrium because it was then in the interests of both producers to raise the supply price from this point.

At the lowest possible price set by say *producer 2*, *producer 1* would have the opportunity to serve the remainder of the market at a price most advantageous to them. In this instance *producer 1* need not be concerned by the actions of *producer 2* because *producer 2* was already producing at the level of their capacity constraint and had thrown its entire supply on to the

market. In turn, the best that *producer 2* could do would be to follow the lead set for it by *producer 1* and raise its price in turn.

Edgeworth speculated that the supply price adjustment process on its way down may not in fact reach the lowest price possible. This was because one of the producers could realise during the downward price adjustment process that it may be more advantageous for them to supply "that remainder of customers of which he cannot be deprived by his rival (owing to the [other producer's] limitation of supply)".[235] Edgeworth postulated that long before the lowest price point was reached, it may be more profitable for one of the producers to raise the supply price charged rather than lower it any further.

Edgeworth concluded that the price charged by the two producers would be in *perpetual motion* between two points: the maximum price charged that would correlate to the point where the two producers behaved as if they were in combination with each other and divided up the market equally between them; and the minimum price point where it was in the interests of neither producer to lower the supply price any further because they could not gain any more profit from doing so and could not supply any of the additional demand created in any event.

The second part of the development of oligopoly theory saw the move away from arguments over the relative merits of competing models of duopoly through the development of more elaborate models.

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[235] *ibid.*, p. 120.

Hotelling was critical of the prevailing presumption of an essential instability within duopoly.[236] Instead, Hotelling contended that the independent actions of two competitors could indeed lead to an equilibrium position much less fragile than had been generally presumed.

According to Hotelling, implicit within the prevailing models of duopoly was that all buyers would only deal with the cheapest seller of a product, which in turn would lead to an indeterminate solution and instability. On the other hand, Hotelling argued this type of instability would "disappear when the quantity sold by each [seller] is considered as a continuous function of differences in price".[237] Instead, Hotelling contended that if a seller raised their price relative to its competitor, then they would gradually lose business to their rival over time but would not lose all of its business instantaneously. It was maintained that some buyers would still prefer to trade with the higher priced seller for any number of reasons, particularly where transportation costs were lower than in dealing with another seller.

In Hotelling's model, it was assumed that buyers of a commodity were uniformly distributed along a line and that no customer had any preference for one of two sellers except on the basis of price plus transportation costs being lower. It was also assumed that each seller adjusted their price so that, with the existing value of the other seller's price, their own profit would be maximised. An equilibrium position would eventually be reached because it was not possible for either seller to increase profit by changing their price.

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[236] Hotelling, H. (1929) Stability in Competition. *The Economic Journal* 39, 41-57.
[237] *ibid.*, p. 44.

A further modification introduced into the model was giving each seller the ability to choose their location along the line. This would lead to the outcome that both sellers would cluster in the middle of the line in order to maximise their business reach, rather than distribute themselves at socially optimal points in order to minimise transportation costs accruing to customers. From this result, Hotelling drew the observation that "buyers are confronted everywhere with an excessive sameness".[238] However, if a new seller chose to sell a product exactly like one already on the market, then they risked triggering off a price cutting war as described by Bertrand. On the other hand, Hotelling asserted that "there is an incentive to make the new product very much like the old, applying some slight change which will seem an improvement to as many buyers as possible without ever going far in this direction".[239]

Chamberlin was critical of the prevailing solutions to the problem of duopoly and oligopoly because they did not conform "to the hypothesis that each seller acts so as to render his profit a maximum".[240] In order for a producer to maximise profit in an oligopoly situation, Chamberlin contended that a producer would need to take account of their total influence upon the prevailing selling price of the product. This included both the direct as well as the indirect effect. Chamberlin reasoned that when a producer made a direct effect on the selling price of a product by changing the selling price, which would in turn elicit a countermove on the part of a

[238] *ibid.*, p. 54.
[239] *ibid.*, p. 54.
[240] Chamberlin, E. H. (1948) *The Theory of Monopolistic Competition.* Sixth Edition, Harvard University Press, Cambridge, Massachusetts, p. 46.

rival producer, it would be stupid for that producer to ignore the likely countermove or indirect effect in determining their initial course of action.

Chamberlin further contended that if each producer sought to maximise their profit rationally and intelligently, they would realise where there were only two or a few sellers, that any move on their part would have a considerable effect upon their competitors. Hence, it was unlikely that a producer was going to accept losses imposed upon them through the actions of another producer without retaliation. On this basis, it was asserted that since a price cut by any producer would inevitably reduce the profits for each producer, producers would in turn be disinclined to reduce their selling price and the equilibrium result would be the same as if all the producers had combined to form a monopoly. Therefore, Chamberlin concluded that when producers collectively took account of their total influence upon the selling price, then the outcome was always reminiscent of a monopoly situation.

Fellner devised a quasi-bargaining solution to the problem of oligopoly when there is no explicit cartel agreement between parties.[241] Instead of engaging in explicit negotiations in order to arrive at a formal cartel agreement, under quasi-bargaining each party tries to find out from the responses of the other parties what the ultimate consequences of its own patterns of behaviour are.[242] According to Fellner, this process is very much like *making offers* and seeing whether they are either accepted or rejected.[243] From this process, each party tries to discover which tacit agreement or

[241] Fellner, W., *op.cit.*
[242] *ibid.*, pp. 15-16.
[243] *ibid.*, p. 23.

convention is most favourable from its point of view while still being acceptable to others.[244] Once a certain pattern of behaviour becomes established, it is *as though* an *offer* has been accepted.[245] From this process of quasi-bargaining a quasi-agreement is struck between the parties. While an explicit cartel agreement requires direct contact between the parties, a quasi-agreement does not. Whereas a cartel agreement between parties results in collusion, Fellner describes the outcome arising from a quasi-agreement as *spontaneous co-ordination.*

Similar to Fellner, Kaysen outlined his *mutual dependence* theory of oligopoly, whereby firms could adopt a common course of action in the market in order to maximise their collective profits without engaging in a formal price fixing arrangement.[246] In this case, each firm would recognise their interdependence and that any action they took would have repercussions through the actions of rival firms. Kaysen asserted each rival firm would realise that any price cut would be matched by their rivals, and that they could not continue to undersell rivals by cutting prices indefinitely. According to Kaysen, the recognition of this mutual dependence would mean that no machinery of reporting or enforcement would be necessary to secure adherence to a common goal as each rival would recognise that there was nothing to be gained by not conforming to it.

In Kaysen's opinion, the determination of a common goal within an oligopoly, in order to arrive at a monopoly price in the absence of explicit

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[244] *ibid.*, p. 16.
[245] *ibid.*, p. 23.
[246] Kaysen, C. (1951) Collusion Under the Sherman Act 1. *The Quarterly Journal of Economics* 65, 263-270.

communication between the parties, came down to a question of probability. This probability increased given the fewer number of firms there were supplying a standard commodity, with no close substitutes in an economy where tastes and techniques changed little and slowly.

According to Kaysen, the recognition of mutual dependence amongst an oligopoly meant that rival firms must in any fixed market situation charge the same price for a standard commodity. In the absence of explicit communication between the parties in order to arrive at a common goal, Kaysen asserted that something else would form the basis of uniformity amongst the oligopoly. This was described as "an agreement to agree".[247]

This was defined as the recognition by each firm that it may be more advantageous for them to follow a single judgment of the changing market situation (even though it was not their own and they may sometimes disagree with it), than to engage in the struggle which could arise if each firm attempted to enforce their own views. The upshot of this was that each firm sacrificed its exercise of independent judgment in the market in return for a greater degree of certainty as to what their rivals would do.

Kaysen concluded that long continued uniformity of action, taken over a period of changing market conditions, could be used to infer, with a high degree of certainty, at least the existence of an *agreement to agree*. Hence, it followed from this that parallel conduct by rival firms in an oligopoly could form the basis of an inference of collusion in this extended form.

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[247] *ibid.*, p. 268.

Another set of theories that have been postulated to explain the pricing behaviour within oligopolistic markets is price leadership. Stigler identified two different types of price leadership.[248] The first was where the dominant firm set the price of the product, allowing the minor firms to sell whatever quantity of product they wanted at that price and supplying the remainder of the market. The second was where a firm was the first to announce price changes that were usually followed by the rest of the firms, even though the initiating firm may not occupy the dominant position in the market. Under this type of price leadership, labelled as barometric, the price leader commands adherence by rivals to the price set only to the extent that this price reflects market conditions with tolerable promptness.[249]

In addressing the question of circumstances that give rise to co-operative behaviour leading to tacit collusion within an oligopoly, Stigler was critical of the prevailing orthodoxy.[250] Stigler argued that the prevailing theories of oligopoly assumed rather than deduced behaviour which he considered to be an unsatisfactory state of affairs:

> A satisfactory theory of oligopoly cannot begin with assumptions concerning the way in which each firm views its interdependence with its rivals. If we adhere to the traditional theory of profit-maximising enterprises, the behaviour is no longer something to be assumed but rather something to be deduced.[251]

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[248] Stigler, G. J. (1947) The Kinky Oligopoly Demand Curve and Rigid Prices. *The Journal of Political Economy* 55, 432-449, p. 436.
[249] *ibid.*, p. 446.
[250] Stigler, G. J. (1964) A Theory of Oligopoly. *The Journal of Political Economy* 72, 44-61.
[251] *ibid.*, p. 44.

Rather than assuming the manner in which firms would behave, Stigler sought to identify what industry characteristics gave rise to collusion, as well as those that made it more difficult to achieve.

In his model, Stigler assumed that collusion takes the form of a joint determination of output and price by ostensibly independent firms. Once the form of collusion had been agreed upon, the critical issue was to ensure the stability of the collusive agreement. This became an issue of enforcement, as it was recognised that any member of the agreement could maximise their own individual profit by undercutting other members on the agreed price. To Stigler, enforcement of the agreement consisted of being able to detect significant deviations from the agreed-upon price. It was contended that price deviations would disappear once detected, as they would be matched by fellow conspirators if not subsequently withdrawn.

Stigler maintained that probably the most effective means of thwarting secret price reductions was to fix market shares amongst rivals. Through the inspection of output and an appropriate mechanism for the redistribution of gains and losses from deviations from the assigned quota, Stigler argued that the incentive to engage in secret price-cuts would be eliminated. Another alternative means of eliminating secret price-cutting was to assign each buyer to a single seller. However, where the turnover of buyers was large this was recognised as impractical.

According to Stigler, an oligopolist would not consider making secret price cuts to buyers whose purchases fell below a certain size relative to their aggregate sales. From this, it was deduced that oligopolistic collusion would

often be effective against small buyers even when it was ineffective against large buyers. This was Stigler's first prediction from his model.

Stigler asserted that the detection of a secret price cut would be made as difficult as a cheating firm could possibly make it. The price cut could take some indirect form through modifying some non-price dimension of the transaction. In the absence of any other means of detecting price cutting, Stigler inferred that the basic method of detection must be that a firm was getting business to which it would not otherwise gain. Under Stigler's definition of perfect collusion, no buyer changed sellers voluntarily, hence there was no competitive price-cutting if there was no shift of buyers amongst sellers. This led Stigler to his second prediction that collusion would always be more effective against buyers who report correctly and fully the prices tendered to them.

The absence of price competition through buyer loyalty leads Stigler to his third prediction, that collusion was severely limited (excluding the possibility of market sharing) when the significant buyers constantly change identity.

Stigler recognised that in the *real world* normal market conditions would consist of both stability and change. Hence, there may be a small rate of entry of new buyers as well as some shifting of customers even under an effective collusive agreement. These minor reasons for changing buyer allegiance could be lumped together under the category of *random factors*. According to Stigler, the key to distinguishing between random factors and secret price cutting to explain changing customer allegiance came down to

circumstantial evidence or probability. Stigler believed that there were three areas to examine for evidence of secret price-cutting:

1. The behaviour of a firm's own old customers.

2. The attraction of old customers of other firms.

3. The behaviour of new customers.

In his model, Stigler calculated the maximum additional sales obtainable by secret price-cutting from any one rival beyond which a rival firm would infer that price cutting was actually taking place. Stigler also found that the pooling of information between rivals also substantially reduced the scope for secret price-cutting.

A key finding from Stigler's model is that the aggregate gain in sales to a firm from secret price-cutting, thus its total incentive to cheat, is the sum of the gains from each rival firm, and is therefore increased roughly in proportion to the number of rival firms. In other words, the more rivals there are, the easier it is going to be to cheat on a collusive arrangement. Another important finding was that the incentive to cheat by secret price-cutting falls as the number of customers per seller increased. This reflected that the pay-off from cheating diminished in the event that buyers are relatively small in the size of their overall purchases.

Stigler also extended his model to cover non-price variables as well, subject to two critical modifications. The first was that there had to be a definite joint profit-maximising policy upon which the rival firms could agree. According to Stigler, collusion was less feasible the less clear the basis on

which it should proceed. The second was that the competitive moves of any firm would differ widely among non-price variables in their detectability by rivals. Thus, while some forms of non-price competition were easy to detect such as advertising, product quality and service, some variants of non-price competition could prove more elusive to detect.

Following on from Stigler, Posner has developed a two-stage typological approach for the detection of collusion within an oligopoly market, and draws no distinction between tacit or overt collusion.[252] The first part involves the identification of those market conditions which make it predisposed towards collusion. The second part involves determining whether or not collusion is actually occurring.

Posner identifies several market conditions as rendering a market favourably predisposed towards collusion including the following:

1. Market concentrated on the selling side.

2. No fringe of small sellers.

3. Inelastic demand at the competitive price.

4. Many customers with no concentration on the buying side of the market.

5. Standard (homogeneous) product.

6. The principal firms sell at the same level in the chain of distribution.

7. Price competition is more important than other forms of competition.

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[252] Posner, R. A., *op.cit.*

8. The industry's competition law compliance *record*.

Posner then outlines several conditions exhibited in a market as providing evidence of collusive behaviour, including the following:

1. Fixed relative market shares.

2. Exchanges of price information between firms.

3. Demand elasticity at the market price.[253]

4. The possible inference of collusion from the presence or pattern of abnormally high profits.

Moving on from simple models of duopoly, oligopoly theory essentially became a theory about the dynamics of tacit collusion between rival firms. This was because many of the models of oligopoly were predicting that oligopoly resulted in some kind of co-ordinated conduct between firms, leading to a tacitly collusive outcome. Stigler's major contribution, followed by Posner, was to challenge this general presumption. Instead, Stigler rigorously examined the conditions conducive to arriving at a tacitly collusive outcome that was later extended by Posner.

The most significant recent contribution to oligopoly theory has been the development of dynamic models taking a game-theoretic approach. Although earlier theories of oligopoly contained dynamic elements in their derivation, they treated the oligopoly problem in a static framework which ignored the time dimension.

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[253] Posner observes that a monopolist would never sell at a price where demand is inelastic as it could increase profits by reducing output and increasing the price.

Nash made his contribution to game theory through the development of non-co-operative games.[254] Nash based his approach around the absence of coalitions by assuming that each player acts independently, without collaboration or communication with any other player. Friedman has argued that oligopoly is an example of a non-co-operative game because competition laws generally preclude legally enforceable agreements between rival firms.[255]

Through his development on the theory of non-co-operative games, Nash derived a non-co-operative equilibrium concept. A Nash equilibrium is a strategy profile such that every player's strategy is a best response to the strategies of all other players.[256] It requires that each player plays their best response and that expectations regarding the play of their rivals are correct.[257] In a Nash equilibrium position, it is impossible for any single player to increase their payoff through the use of a different strategy, given the strategies of all the other players.

An important property of a Nash equilibrium is that no player can have any *ex post* regret.[258] Given the strategies deployed by the other players, each player is doing as well as they can and no player has any incentive to change strategies even if they were given the opportunity to do so.

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[254] Nash, J. (1951) Non-Co-operative Games. *Annals of Mathematics* 54, 286-95, reprinted in Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterization and Applications.* Cambridge University Press, Cambridge, 82-99.
[255] Friedman, J. (1983) *Oligopoly Theory.* Cambridge University Press, New York, p. 209.
[256] Church, J. and Ware, R. (2000) *Industrial Organization: A Strategic Approach.* Irwin McGraw-Hill, Boston, pp. 220-221.
[257] *ibid.*, p. 221.
[258] *ibid.*, p. 221.

It was soon recognised that the Nash non-co-operative equilibrium solution was a generalisation of the duopoly solution originally derived by Cournot.[259] The assumptions underpinning both the Nash non-co-operative equilibrium solution and the Cournot duopoly solution are exactly the same, in that each player is doing the best they can given the strategy engaged in by the other player or players. The practical implications of this means that the Cournot solution is also the Nash equilibrium in a one-shot (one period) game where quantities are used as the strategic variable by players.

Since Stigler (1964), oligopoly theory has been often viewed as the problems associated with enforcing a tacitly collusive agreement between market rivals. The success or otherwise of such enforcement in turn depends on the ability to detect and then punish any firm or firms that choose to deviate from the tacitly collusive agreement.

Game theory has demonstrated that players are likely to engage in more co-operative strategies towards each other if they have repeated interactions than if they interacted only once. The significance of this result for oligopoly theory was first recognised by Friedman in relation to an infinitely repeated game or so-called supergame.[260] Friedman contended that a Cournot solution was not an entirely satisfactory outcome when each firm must realise that a higher level of profits could be simultaneously obtained by each firm.

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[259] See: Hurwics, L. (1953) What Has Happened to the Theory of Games. *The American Economic Review* 43, 398-405, p. 402.
[260] Friedman, J. W. (1971) A non-co-operative equilibrium for supergames. *Review of Economic Studies* 38, 1-12, reprinted in Daughtety, A. F. (ed) (1988) *Cournot Oligopoly: Characterization and Applications*. Cambridge University Press, Cambridge, 142-157.

Within Friedman's model, a tacitly collusive outcome is driven by the removal of incentives for firms to cheat and deviate from the profit maximising position for the group as a whole. Although a firm can increase their single period profit for a period or so and may be tempted to do so, it is likely to be dissuaded by the response of the other firms who revert to a *safe* position as one in which no firm has any temptation to move for the sake of short term gain. Because of this, firms neither forego profit nor behave in a manner that exposes them to being *double-crossed.*[261] Friedman offers up a couple of explanations as to how this tacitly collusive outcome could be supported. One explanation is that the market moves of firms are interpretable as messages. The other explanation is that tacit collusion occurs spontaneously, as all the firms recognise the shortsightedness of Cournot type behaviour and instead behave more co-operatively towards each other.

The result that a co-operative solution supporting a tacitly collusive outcome between rivals in an infinitely repeated game has since become tagged as the folk theorem. The term folk theorem is employed because this result was widely conjectured before it was formally demonstrated.[262]

Within Friedman's model, no firm ever has an incentive to cheat and defect from behaving in a collusive manner because it becomes unprofitable to do so. However, Green and Porter develop their model with imperfect information, whereby it is possible for collusive behaviour to break down between rival firms not because of any cheating, but arising from falling

[261] *ibid.*, p. 157.
[262] Baker, J. B. (1993) Two Sherman Act section 1 dilemmas: parallel pricing, the oligopoly problem, and contemporary economic theory. *The Antitrust Bulletin* 38, 143-219, p. 154.

demand.[263] It is assumed that the product is homogeneous so that all firms face a common price. Within this model, market demand for the product is not directly observable and hence firms are unable to detect any demand fluctuations. Firms monitor the market price of the product as an imperfect proxy for the output of other firms in order to detect any evidence of cheating and defection away from collusive conduct on the part of other firms. While firms behave monopolistically as the price remains high, a fall in price will prompt firms to revert to Cournot behaviour. Green and Porter assume that firms agree on a *trigger price* which they compare to the market price when they set their production.[264] If the market price should fall below the trigger price while the firms have been acting monopolistically, they will revert to Cournot behaviour before resuming collusive behaviour. In this manner, Green and Porter contend it is possible to observe both Cournot behaviour as well as collusive behaviour in an oligopoly over time.

Bernheim and Whinston have constructed a model that allows for multimarket contact with repeated interactions between firms.[265] Multimarket contact enables firms to transfer the ability to tacitly collude from one market across to another market, which allows for the pooling of their incentive constraints across markets.[266] It is observed that when firms differ in their costs of production across markets or when economies of scale are present, multimarket contact allows for the development of *spheres*

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[263] Green, E. J. and Porter, R. H. (1984) Non-co-operative Collusion under Imperfect Price Information. *Econometrica* 50, 87-100.
[264] *ibid.*, p. 89.
[265] Bernheim, B. D. and Whinston, M. D. (1990) Multimarket contact and collusive behaviour. *The Rand Journal of Economics* 21, 1-26.
[266] *ibid.*, p. 8.

of influence.[267] If production is shifted towards the more efficient firm within their own sphere of influence, then costs can be reduced and prices along with profits increased for all firms engaged in tacit collusion. Furthermore, multimarket contact under such circumstances reduces the incentives of firms to cheat on the tacitly collusive agreement. In the presence of spheres of influence it is observed that geographically-based, reciprocal trades of output may facilitate the maintenance of collusive prices.[268]

The folk theorem has provided some support for those earlier theories that hypothesised that oligopoly resulted in co-ordinated conduct between firms leading to tacit collusion.

Earlier theories of oligopoly have also been put into a dynamic framework through the application of game theory. Maskin and Tirole provide the equilibrium foundations for the dynamics of the Edgeworth price cycle.[269] In the Maskin and Tirole model, two firms take turns in choosing prices and a firm's decision depends only on the other firm's current price. Each firm decides to undercut the other firm on price and steal the entire market share for that period. This process continues until the competitive price is reached (where price is equal to marginal cost). Once the competitive price is reached, each firm will try to induce the other firm to increase its price. Eventually, one firm will relent and raise its price at which point the price cycle will begin again.

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[267] *ibid.*, p. 2.
[268] *ibid.*, p. 2.
[269] Maskin, E. and Tirole, J. (1988) A Theory of Dynamic Oligopoly, II: Price Competition, Kinked Demand Curves, and Edgeworth Cycles. *Econometrica* 56, 571-599.

3.4 Conclusion

The potential for double marginalisation provides a possible explanation for the conundrum as to how the oil majors can be simultaneously accused of both price fixing and predatory pricing. In order to exercise any market power at the wholesale level in order to maximise profits, the oil majors need to drive the retail petrol price down to marginal cost. In other words, the oil majors would want a retail sector that approximates perfect competition where price is equal to marginal cost. If the oil majors are behaving in a manner consistent with driving the retail price of petrol down to marginal cost, then this suggests that retail petrol prices should convey information regarding the oligopolistic interactions of participants in wholesale petrol markets and that retail petrol prices should closely follow and reflect changes in wholesale petrol prices. This is an important finding that will underpin the hypothesis testing that is undertaken in Chapter 6.

The development of a comprehensive and unifying theory of oligopoly has proven to be elusive. Alternative models of oligopoly can support a multitude of outcomes. However, a survey of oligopoly literature reveals that co-operative behaviour between rival firms in an oligopolistic market leading to tacit collusion is a distinct possibility. Stigler (1964), along with Posner, provide a rigorous framework in which to test whether market conditions are conducive to tacit collusion or not. In turn, the major contribution of game theory to the development of oligopoly theory has been to show that a tacitly collusive outcome can be supported in situations where there are repeated interactions between market participants over time. Consideration of these factors will assist in determining whether market

conduct within capital city wholesale petrol markets is consistent with tacit collusion and whether REAs assist in facilitating tacit collusion (assuming that capital city retail petrol markets are competitive).

Chapter 4: Reciprocity

4.1 Introduction

This Chapter will examine and critically review the academic literature pertaining to the competitive effects of business reciprocity (which shall be described as reciprocity hereafter). As REAs are a particular form of reciprocity, this Chapter will draw out the implications for the operation of REAs from the reciprocity literature. This Chapter will attempt to identify under what conditions reciprocity is likely to give rise to anti-competitive as well as pro-competitive outcomes.

Views and opinions have been varied as to what exactly constitutes reciprocity. The minimalist view has it that reciprocity is simply the practice of a firm buying from its own customers.[270] An extension on the minimalist view has it that reciprocity is the act of demonstrating a preference or favouring a firm's own customers when selecting suppliers.[271]

Another interpretation has it that reciprocity is a conditional transaction between firms, whereby *firm A* agrees to purchase goods and/or services from *firm B* in return for *firm B* agreeing to acquire goods and/or services from *firm A*.

It has been postulated that reciprocity also refers to mutual trading between firms "that is unexplained by either chance or ordinary cost-quality

[270] Anderson, J. F. (1967) Reciprocal Dealing. *The Yale Law Journal* 76, 1020-1029, p.1020.
[271] Allen, B. T. (1975) Industrial Reciprocity: A Statistical Analysis. *The Journal of Law and Economics* 18, 507-520, p.505; Hausman, R. M. (1964) Reciprocal Dealing and the Antitrust Laws. *Harvard Law Review* 77, 873-886, p. 873.

advantages".[272] Finally, it has also been put that reciprocity is the practice of a firm using its purchasing power over suppliers to promote, or in some cases compel, the sale of its goods and/or services to those suppliers.

For present purposes, there is no need to move beyond a minimalist view in defining reciprocity, although reciprocity can also encompass many of the characteristics contained in the other definitions.

Views on the competitive effects of reciprocity have been mixed. Serious discussion and debate over the competitive effects of reciprocity was probably triggered by Stocking and Mueller when they contended that reciprocity, when practiced by big business in national markets, resulted in an anti-competitive detriment.[273] Within the academic literature there are three main strands of opinion on the competitive effects of reciprocity:

1. Reciprocity is always anti-competitive;

2. Reciprocity can be anti-competitive under certain conditions; and

3. Reciprocity is not anti-competitive.

Those who contend that reciprocity is always anti-competitive maintain that it distorts the usual means of exchange based on price, quality and service, thus foreclosing some participants from the market place. Competition concerns regarding foreclosure have sometimes been raised in regard to the operation of REAs. On the other hand, those who hold that reciprocity is only likely to raise competition issues under certain conditions find that the

[272] Blair, R. D. (1973) Reciprocity and Competition: A Problem of Conflicting 'Assumptions'. *Antitrust Law & Economics Review* 6, 77-86, p. 78.
[273] Stocking, G. W. and Mueller, W. F. (1957) Business Reciprocity and the Size of Firms. *The Journal of Business* 30, 73-95.

existence of market power is a necessary prerequisite for this to occur. Alternatively, those who contend that reciprocity does not raise any competition issues have generally done so on the basis that it is not possible to leverage market power from one market over to another unrelated market and thereby extend and increase the overall level of market power.

Some have also argued that reciprocity is pro-competitive because it facilitates more flexible pricing than would otherwise prevail in an oligopolisic market. On the other hand, critics have countered that reciprocity enables a rigid oligopolistic pricing structure to continue even under circumstances where it might otherwise breakdown. The pricing issue in regard to reciprocity is further complicated when it is practised by firms who are competitors in the same market, as is the case with respect to REAs. Reciprocity when practiced between market competitors may give rise to concerns that it could be used to facilitate collusion. This has been one of the main concerns raised in relation to REAs.

Another interpretation for reciprocity is provided by those who take a transaction cost approach. In this case, reciprocity can be pro-competitive and efficiency enhancing by facilitating the construction of optimal production facilities while minimising on the associated transaction costs through mitigating the risk of post-contractual opportunistic behaviour. However, others have offered a more sinister interpretation, arguing that a transaction cost approach to reciprocity could also serve as a means to enforce discipline amongst a cartel. It has been argued that the conditions

imposed on competitors through REAs act in such a manner as to facilitate co-operation between competitors which inhibit and stifle competition.

All of the academic literature comes from the United States, which probably reflects the pre-eminent position held by the United States in the evolution and development of competition law and economics. In addition, the bulk of academic literature on reciprocity comes from the 1960s and the early 1970s when it was widely considered as being anti-competitive.[274] The decision by US law enforcement authorities to cease initiating actions based on reciprocity during the 1970s curtailed the debate over the competitive effects of reciprocity and has left the topic largely dormant since that time.[275] In 1982, Baker and Blumenthal commented that reciprocity had "withered away".[276] By 2000, Waller had declared reciprocity as a "moribund doctrine for enforcement purposes".[277]

4.2 Is Reciprocity Always Anti-Competitive?

Those who contend that reciprocity is anti-competitive under all circumstances have generally relied on three main propositions:

1. Reciprocity undermines the traditional means of exchange for a customer who would normally base their decision solely upon the criteria of price, quality and service;

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[274] Cavanagh, E. D. (2001) Reciprocal Dealing: A Rebirth? *St Johns Law Review* 75, 633-648, p. 634.
[275] *ibid.*, pp. 634-635.
[276] Baker, D. I. and Blumenthal, W. (1983) The 1982 Guidelines and Preexisting Law. *California Law Review* 71, 311-347, p. 339.
[277] Waller, S. W. (2000) Can U.S. antitrust laws open international markets? *Northwestern Journal of International Law & Business* 20, 207-232, p. 219.

2. Reciprocity forecloses markets on competitors who are not suitably diverse in their range of activities; and

3. Reciprocity is conducive to the creation of oligopolistic or monopolistic market structures.

Concerns have been expressed that because reciprocity distorts the usual means of exchange based on price, quality and service, potentially more efficient producers of a particular product may be limited in their market participation or excluded from the market altogether. This in turn could result in a loss of both allocative and productive efficiency and thus entrench a market structure conducive to sub-optimal outcomes.

Stocking and Mueller believed that reciprocal trading arrangements were anti-competitive because they enabled large and diversified firms to expand their production without resort to price competition at the expense of smaller rivals.[278] Thus, reciprocity enabled firms to increase their sales whilst being able to avoid price competition: "[i]t is one of several tools in the oligopolist's kit designed to increase sales without resorting to price-cutting".[279] The consequence of reciprocity was to facilitate firm expansion and thereby achieve greater security. Reciprocity was thus characterised as symptomatic of markets where there was imperfect competition, which would result in less than optimal outcomes.

Prior to the 1970s, the FTC also took the view that reciprocity was anti-competitive because it enabled companies to foreclose on a section of a

[278] Stocking, G. W. and Mueller, W. F., *op.cit.*, p. 94.
[279] *ibid.*, p. 95.

market and thus exclude other competitors from the opportunity of competing for it. The FTC raised concerns that reciprocity could thus be used to exclude efficient producers from the market, leading to a loss of economic efficiency:

> [Reciprocity] transforms substantial buying power into a weapon for denying competitors less favourably situated access to the market. It distorts the focus of the trader by interposing between him and the traditional competitive factors of price, quality, and service an irrelevant and alien factor which is destructive of fair and free competition on the basis of merit. The efficient producer may thereby suffer loss because of a circumstance extrinsic to the worth of his product. In this situation, it is relative size and conglomeration of business rivals, rather than economic efficiency, that may determine firm growth and success, and, ultimately, the allocation of resources. Obviously, this practice strikes at one of the basic premises of a free enterprise economy.[280]

Donnem described the detriment arising from reciprocity as denying competitors the opportunity of making sales they would otherwise be in a position to make:

> The vice of reciprocity and the reciprocity effect is that disadvantaged competitors – often small companies and single-line companies – are deprived of sales they would otherwise be able to make on the basis of price, quality and service.[281]

Hausman contended that reciprocity was anti-competitive because it distorted the operation of the market process from which several adverse

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[280] Federal Trade Commission (1967) Opinion of the Commission, 15 November, 1962, Consolidated Foods Corp. *Federal Trade Commission Decisions: Findings, Opinions, and Orders January 1, 1963, to June 30, 1963* 62, US Government Printing Office, Washington DC, p. 952.

[281] Donnem, R. W. (1969) The Antitrust Attack on Reciprocity and Reciprocity Effect. *Antitrust Law Journal* 38, 637-651, p. 637.

consequences flowed.[282] First, concern was expressed that because purchasing decisions could be made on the basis of factors other than price and quality, this could potentially result in lower welfare for consumers of a product. Second, concern was expressed that reciprocity would distort industrial structure by enabling less efficient firms to survive and prosper to the detriment of the more efficient. Third, concern was expressed that reciprocity could act as a barrier to entry by discouraging potential new entrants in the knowledge that would-be customers were tied up and denied to them through reciprocal dealing arrangements. It was also further presumed that the potential barrier to entry posed by reciprocity may also remove any restraining influence over the conduct of those participating in such practices.

Mueller asserted that reciprocity injured the competitive process through several mechanisms.[283] In the first instance, it was argued that reciprocity distorted the market exchange process, thereby encouraging more rigid price structures and thus leading to a misallocation of resources. This misallocation of resources was further exacerbated in the case of an oligopolistic market structure where the larger firms could engage in reciprocity to foreclose the market to other competitors. Mueller believed that reciprocity could raise barriers to entry in a market by tying up the potential customer base, thereby making entry less attractive to

[282] Hausman, R. M., *op.cit.*
[283] Mueller, W. F. (1971) The Rising Economic Concentration in America: Reciprocity, Conglomeration, and the New American 'Zaibatsu' System (II). *Antitrust Law & Economic Review* 4, 91-104.

newcomers.[284] The consequence of reciprocity would ultimately be increased industrial concentration.

Against those who maintained that reciprocity was always anti-competitive, another school of thought held that reciprocity was only likely to result in an anti-competitive detriment if a firm was able to exercise market power. In this case, concern arose because a firm with market power in one market was able to leverage that power over to a second unrelated market and thereby extend and enhance its overall level of market power. This set of circumstances describes what has become known as *coercive reciprocity*.

Harsha categorised reciprocity according to the following typology:

1. Resort to coercion whereby one company threatens to withdraw patronage if the other company doesn't reciprocate in its buying.

2. A mutual agreement whereby each company reciprocally agrees to buy from the other.

3. Suggestions by one company that the other company should buy from the first in view of the first company's purchases from the other.

4. One company purchases from another, tacitly hoping that the other company will thereby reciprocate.[285]

[284] *ibid.*, p. 96.
[285] Harsha E. H. (1963) The Conglomerate Merger and Reciprocity – Condemned by Conjecture? *Antitrust Bulletin* 9, 201-230, p. 208.

Harsha queried whether reciprocity was necessarily associated with market power, arguing that it also occurred in many other situations where no market power was present at all.

Although recognising that reciprocity could undermine what some considered to be the generally accepted nature of market exchange, Harsha asserted that "it would be naïve not to concede that many other extraneous factors do play a part in business purchasing decisions".[286]

A major concern with coercive reciprocity was that it would "ripen into a mutual reciprocity agreement and be superficially indistinguishable from an agreement which is entered into without coercion".[287] Harsha believed that instances of flagrantly coercive reciprocity should be easily shown to involve companies with substantial market power, or even be in a monopoly position.[288]

Handler was also sceptical of claims that reciprocity was generally anti-competitive.[289] Handler opined that unless coercion was involved then reciprocity was not anti-competitive. Where no coercion was involved, Handler believed that it should be left to the market to regulate such practices.

Similar to Stocking and Mueller, Dean believed that reciprocity was most likely to occur in oligopolistic industries.[290] Unlike Stocking and Mueller,

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[286] *ibid.*, p. 211.
[287] *ibid.*, p. 212.
[288] *ibid.*, p. 212.
[289] Handler, M (1963) Emerging Antitrust Issues: Reciprocity, Diversification and Joint Ventures. *Virginia Law Review* 49, 433-447.
[290] Dean, J. (1963) Economic Aspects of Reciprocity, Competition and Mergers. *The Antitrust Bulletin* VIII, 843-852.

however, Dean believed reciprocity was just one possible manifestation of market power which could only wrought damage if all other avenues of expression had been blocked, or if exercising market power through reciprocity inflicted more harm than through other means. According to Dean, the remedy to any anti-competitive detriment arising from reciprocity was to attack its root cause, which is market power, rather than attempt to regulate the practice in any manner.

Sichel maintained that the amount of competitive harm wrought by a practice depended upon the extent of coercion and the degree of exclusivity it engendered.[291] It was argued that if a practice was voluntary, where no party involved was coerced, and if competitors or potential competitors also had the opportunity to engage in similar conduct, then it should be exempt from the scope of competition law.[292] Sichel attributed the existence of coercive reciprocity to pre-existing market power and maintained that prohibiting reciprocity failed to address the underlying problem.

Similar to Harsha, Finney proposed a typology for reciprocity in order to distinguish between significantly anti-competitive reciprocity from other varieties.[293] Finney believed that reciprocity could ultimately be narrowed down into two main categories:

1. Friendship reciprocity; and

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[291] Sichel, W. (1968) Business Reciprocity: An Unsettled Antitrust Issue. *The Antitrust Bulletin* 13, 649-658.
[292] *ibid.*, p. 652.
[293] Finney, F. R. (1969) Reciprocity and Public Policy. *Antitrust Law and Economic Review* 2, 97-110.

2. Coercive reciprocity.[294]

Friendship reciprocity was defined as "the simple act of purchasing from the individual or firm that is also one's customer".[295] Finney believed that friendship reciprocity was benign in terms of its competitive impact because it was unable to present a firm with foreclosure opportunities over its rivals.

On the other hand, coercive reciprocity was distinguished from friendship reciprocity on the basis that it "requires unequal strength between the initiating firm and its "target" supplier" and could only occur under circumstances where the initiating firm had some sort of leverage over the target firm.[296] It was argued that significant economic effects could only occur from coercive reciprocity when the initiating firm did business in more than one industry, some of which it did not share with other competitors. It was reasoned that coercive reciprocity could only significantly foreclose on competition in a market structure where an initiating firm had:

1. A buying unit or units with purchasing leverage; and

2. A selling unit or units *whose competitors cannot muster comparable leverage* and are therefore unable to retaliate in kind when confronted with reciprocal dealing.[297]

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[294] *ibid.*, p. 98.
[295] *ibid.*, p. 98.
[296] *ibid.*, p. 100.
[297] *ibid.*, p. 103.

The key to the competitive impact of reciprocity came down to market structure and reciprocity could only inflict harm when the market structure was conducive to coercive reciprocity.

Lorie and Halpern came to a mixed assessment of the competitive impact of reciprocity.[298] Where markets are perfectly competitive, it was reasoned that reciprocity would result in no anti-competitive detriment. In conditions where markets only depart slightly from being competitive, it was maintained that reciprocity would be unlikely to result in any significant anti-competitive detriment. Lorie and Halpern argued that reciprocity was only likely to result in a significant effect in situations where monopoly, monopsony or regulation existed, and only when opportunities for profitable price discrimination had been effectively thwarted.

Blair believed that "reciprocity can have little effect on competition if *all* of the markets involved are effectively competitive".[299] However, Blair maintained that there were instances where reciprocal trading could have adverse competitive effects. This would occur where reciprocal trading had the potential for altering the long-run structure of an industry by reducing the number of firms, which would occur where barriers to entry are high.

Allison also adopted a typology approach to reciprocity by identifying three different categories:

1. Coercive reciprocity;

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[298] Lorie, J. H. and Halpern, P. (1970) Conglomerates: The Rhetoric and the Evidence. *Journal of Law and Economics* 13, 149-166.
[299] Blair, R. D., *op.cit.*, p. 82.

2. Voluntary reciprocity; and

3. Unilateral reciprocity.[300]

Coercive reciprocity was viewed as the leveraging of market power as a buyer, whereas unilateral reciprocity was considered as the practice of a firm buying from those who are also its customers whenever practicable to do so. Whereas unilateral reciprocity was viewed as benign, Allison considered coercive reciprocity to be detrimental because it could result in the loss of allocative efficiency and market foreclosure.

According to Allison, voluntary reciprocity occurred under two types of conditions. The first was when neither firm possessed sufficient power as a buyer to enforce its own will, which was viewed as harmless in its overall impact on competition. The second occurred when both firms were relative equals in the possession of market power, which Allison considered could inflict about the same amount of damage as coercive reciprocity, resulting in the loss of allocative efficiency and market foreclosure. Allison also opined that the economic harm done by this type of voluntary reciprocity could potentially be far greater than coercive reciprocity, because the effects were likely to be felt in two markets rather than just one alone.[301]

Another school of thinking maintains that concerns regarding the anti-competitive effects of reciprocity are entirely misplaced. Such views have usually been associated with the so-called *Chicago* school of economics.

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[300] Allison, J. R. (1981) The Antitrust Implications of Barter. *Chicago-Kent Law Review* 58, 89-106.
[301] *ibid.*, p. 95.

In the first instance, it was argued that firms being excluded from the market due to the effects of reciprocity did not necessarily result in an anti-competitive detriment. According to Posner, the primary focus of antimonopoly policy should be on the maintenance of competitive pricing, and not on particular numbers of competitors.[302]

In the second instance, scepticism has been expressed regarding the existence of coercive reciprocity. According to this line of reasoning, a firm with pre-existing market power in one market will not be able to leverage this market power over to another unrelated market and thereby extend its overall level of market power through reciprocity and increase the overall level of profits. From this perspective, the use of reciprocity in order to exploit market power becomes irrational unless there is some impediment (such as regulation) preventing a firm from fully utilising its market power directly.

Ferguson argued that firms possessing market power would be much more likely to try to exploit it directly, rather than seek to exercise it indirectly through reciprocity.[303] Ferguson was sceptical of the economic rationale behind any anti-competitive detriment arising from reciprocity, contending that a buyer with market power would use their purchasing power directly to secure lower prices of the intermediate product that they use rather than foist their own product on to suppliers.[304]

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[302] Posner, R. A. (1970) Conglomerate Mergers and Antitrust Policy: An Introduction. *St John's Law Review* 44, 529-532, p. 531.
[303] Ferguson, J. M. (1965) Tying Arrangements and Reciprocity: An Economic Analysis. *Law and Contemporary Problems* 30, 532-580.
[304] *ibid.*, pp. 573-574.

The 1969 *Report of the Task Force on Productivity and Competition* largely dismissed competition concerns arising from the practice of reciprocity by arguing that market power in one market could not be leveraged across to another market:

> The economic threat to competition from reciprocity (reciprocal buying arrangements) is either small or nonexistent: monopoly power in one commodity is not effectively exploited by manipulating the price of an unrelated commodity. The argument advanced against the simplistic treatment of vertical mergers – essentially that one cannot use the same monopoly power twice – also challenges the fears of reciprocity.[305]

Bork has also criticised the notion that reciprocity could be used to transfer and leverage market power from one market over to another unrelated market. It was argued that a firm has only so much market power at its disposal to exploit and if it has already bargained to secure the best possible prices from its suppliers, then it would have no market power left to force suppliers to purchase on non-competitive terms.[306]

However, those who dismiss competition concerns arising from reciprocity due to leveraging have not gone unchallenged. A new school of economic thinking, which has been labelled as *post-Chicago*, has challenged the presumption that it is impossible to increase market power through leveraging and thereby enlarge the overall level of profits.[307] The post-Chicago school contend that when underlying assumptions are modified,

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[305] Stigler, G. J. (Chairman of the Task Force) (1969) *Report of the Task Force on Productivity and Competition*. Reprinted in *Antitrust Law and Economics Review* 2, 30-31.
[306] Bork, R. H. (1970) Antitrust in Dubious Battle. *St John's Law Review* 44, 663-676, p. 671.
[307] Clarke-Smith, J. M. (2002) The Development of Monopolistic Leveraging Theory and its Appropriate Role in Antitrust Law. *Catholic University Law Review* 52, 179-205, p. 199.

then it is possible for leveraging activity to increase market power and profits. Nalebuff has opined that the Chicago School denies the possibility of using leveraging to increase profits only under some strong assumptions and it does not take into account the dynamic games that firms play.[308]

Kaplow believes the critics of leveraging theory have been deficient in their analysis.[309] According to Kaplow, such critics have generally taken a *fixed sum* view of the prevailing degree of market power and have assumed the total amount of damage wrought by a firm exercising market power will be fixed regardless of the practice. A major deficiency with the fixed sum view, in Kaplow's opinion, is that it assumes a firm with market power is only interested in short-run profit maximisation and therefore takes a static view of the world. On the other hand, Kaplow contends that firms may seek to engage in practices described as *monopoly extension*, whereby they seek to change the structural conditions they face in order to receive a greater profit flow in the future.[310] Therefore, if a firm is prepared to take a long-run dynamic perspective as suggested by Kaplow, then leveraging becomes an entirely rational business strategy to pursue.

Whinston has demonstrated that it is quite feasible for leveraging to increase profits where economies of scale exist in the production process and the structure of the market is oligopolistic in relation to tying practices.[311] Whinston has concluded that this result raises "the possibility that the use of

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[308] Nalebuff, B. (2003) *Bundling, Tying, and Portfolio Effects: Part 1 – Conceptual Issues.* DTI Economics Paper No. 1, London, p. 22.
[309] Kaplow, L. (1985) Extension of Monopoly Power Through Leverage. *Columbia Law Review* 85, 515-556.
[310] *ibid.*, p. 524.
[311] Whinston, M. D. (1990) Tying, Foreclosure, and Exclusion. *The American Economic Review* 80, 837-859.

leverage as an effective and profitable exclusionary device could arise" in relation to reciprocity.[312]

Those who mount the case that reciprocity is always anti-competitive would appear to take a fairly doctrinal view about the nature of a market exchange transaction. Harsha is probably correct in his assessment that it is naïve to assume that extraneous factors other than price, quality and service never enter into consideration during a market exchange transaction. On this basis, those who maintain that reciprocity is always anti-competitive would arguably be raising objections to all market exchange transactions not solely based on the criteria of price, quality and service.

It would be difficult to make the case against reciprocity in the absence of market power, as firms presumably would not rationally choose to enter into market exchange transactions on disadvantageous terms. Hence, reciprocity is only likely to raise competition concerns where either one or both parties to a market exchange transaction are able to exercise market power. Therefore, it would appear that the presence of market power on the part of one or both parties to a market exchange transaction is an important prerequisite in determining whether reciprocity is likely to raise competition concerns or not.

Views have been mixed on whether concerns regarding coercive reciprocity, and the ability of a firm to leverage market power from one market over to another unrelated market, are well founded. Criticisms of leveraging theory

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[312] *ibid.*, p. 856.

may be deficient because they fail to take account of a dynamic and longer term perspective, focusing instead on a static short-run world.

Resolving the question of whether coercive reciprocity through leveraging raises legitimate competition concerns probably falls outside the scope of this study. This is because REAs are unlikely to be categorised as coercive reciprocity as both parties are trading on roughly equivalent terms, hence there would be a greatly diminished scope for the leveraging of market power under such circumstances.

The sort of reciprocity most closely approximating that represented by REAs is the voluntary reciprocity described by Allison where both firms could potentially be in possession of market power. On this basis, the possible anti-competitive detriment arising from the existence of REAs is the loss of allocative efficiency and market foreclosure in those markets to which the agreements apply.

4.3 Does Reciprocity Provide for Flexible Pricing?

Rather than being anti-competitive, some have contended that reciprocity is in fact pro-competitive because it provides a means of giving a non-transparent price reduction in an oligopolistic market, thereby injecting some kind of pricing flexibility into a rigid pricing structure with less prospect of provoking retaliation. From this perspective, it could be argued that because output will increase due to the indirect price cut, the market will move more towards a competitive market outcome, and hence reciprocity as practiced in this manner is unambiguously beneficial.

Dean believed that reciprocity was most likely to be found in oligopolistic industries where price competition was muted for fear of retaliation.[313] On balance, Dean concluded that reciprocity was more likely than not to be pro-competitive because it could provide a means of non-price competition.

Anderson argued that reciprocity could be a means through which to increase profits, not by creating new market power, but by allowing the reciprocal trader to capture all of the profits from a position already held through delivering an indirect price cut.[314] Hence, reciprocity could be used in this manner to increase profitability in situations which involved "some obstacle to complete freedom in pricing".[315] It was maintained that reciprocity could be used as an underhanded means to break oligopolistic pricing solidarity and provide a means of cheating with a lower prospect of being detected by competitors and thus minimising the risk of provoking retaliation. Anderson saw such a development as beneficial as it moved a market closer to a perfectly competitive market outcome where price equated to marginal cost.

Sichel has characterised reciprocity as a form of non-price competition that can be used to boost sales without breaking an oligopolistic pricing structure and thus provoking a price war:

> In an oligopoly market reciprocity dealings may be thought of as a form of non-price competition. Firms in their quest for greater profits attempt to increase their volume of sales at the lowest possible price. Outright price cuts are very easily met by rivals,

[313] Dean, J., *op.cit.*
[314] Anderson, J. F., *op.cit.*
[315] *ibid.*, p. 1025.

> whereas various forms of non-price competition are somewhat more disguised and are not apt to be followed as readily.[316]

Stigler opined that reciprocal trading arrangements were unambiguously pro-competitive.[317] If there were economies to be achieved from the practice of reciprocity, then Stigler maintained the practice should spread and that it would not injure competition.[318] It was also argued that reciprocity helped to restore some semblance of price flexibility in a collusive industry where prices are fixed:

> The case *for* reciprocity arises when prices cannot be freely varied to meet supply and demand conditions. Suppose that a firm is dealing with a colluding industry which is fixing prices. A firm in this collusive industry would be willing to sell at less than the cartel price if it can escape detection. Its price can be reduced in effect by buying from the customer-seller at an inflated price. Here reciprocity restores flexibility of prices.[319]

In instances where competition was not effective, such as in an oligopolistic market in which price competition was considered competitively dangerous, Blair argued that reciprocity could serve as a useful device to indirectly cut prices.[320] Thus, Blair believed that reciprocity should be permitted where it resulted in indirect price cuts.

On the other hand, there are those who have been sceptical of the supposed benefits of flexible pricing delivered through reciprocity. Although Hale and Hale recognised that reciprocity could be used as a means to deliver *de facto*

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[316] Sichel, W., *op.cit.*, p. 656.
[317] Stigler, G. J. (1969) *Working Paper IV: Reciprocity: Report of the Task Force on Productivity and Competition.* Reprinted in *Antitrust Law and Economics Review* 2, 51-52.
[318] *ibid.*, p. 52.
[319] *ibid.*, p. 52.
[320] Blair, R. D., *op.cit.*

price cuts to customers, they saw no benefit arising from price reductions delivered in this form as it only resulted in lower prices to those customers who were also suppliers.[321]

Perhaps the strongest argument against the alleged benefits of flexible pricing delivered through reciprocity comes from those who contend that the provision of flexible pricing delivered through this means merely serves to entrench the pre-existing oligopolistic pricing structure and prevent it from breaking down entirely.

Mueller has argued that reciprocity could further entrench an existing oligopolistic market structure, and therefore reinforce price rigidity.[322]

Smith and Wilson asserted that offering a discount or concession through reciprocity without disturbing the formal market pricing was not necessarily a good thing because it acted "as a means of prolonging price rigidity in the marketplace".[323] Similarly, Blake maintained that reciprocal buying assisted in the maintenance of a stable oligopolistic pricing structure in circumstances where such co-operation might otherwise breakdown:

> In an oligopoly market as in a monopoly market, a firm can often maximise profits by charging different users prices which vary according to individual utilities. Although it can charge no more than the oligopoly's list prices, it can "shade" prices to some purchasers by buying from them varying quantities of products they produce, also non-competitively priced, thus winning additional sales without

[321] Hale, G. E. and Hale, R. D. (1964) Reciprocity under the Antitrust Laws: A Comment. *University of Pennsylvania Law Review* 113, 69-76.
[322] Mueller, W. F., *op.cit.*
[323] Smith, H. M. and Wilson, T. M. (1972) Reciprocity and the Private Plantiff. *Maryland Law Review* XXXII, 91-127, p. 93.

> threatening the oligopoly price structure. But for this device, list prices would tend to be lower and would be subject to more direct erosion until a reduction was achieved.[324]

An entirely different perspective on the pricing outcomes delivered through reciprocity emerges when the firms engaging in the practice are in fact market competitors. The issue then becomes one of whether the practice of reciprocity facilitates and maintains a collusive outcome in the market.

Stocking and Mueller raised concerns that reciprocity when practiced amongst rival firms could facilitate collusive conduct:

> Such interchanges bring representatives of rival companies into continuing close contact with each other and permit an exchange of information concerning prices, products, and other market data, which may greatly facilitate the stabilisation of prices.[325]

Similarly, Areeda, Hovenkamp and Elhauge have outlined a threat to competition arising from reciprocity which does not involve the foreclosure of marketing opportunities.[326] In this case, reciprocity may raise competition concerns when it occurs between firms which are rivals. Such reciprocity may be troublesome because it may limit the extent of competition between rivals.[327]

Considered and reasoned arguments are advanced by both those who maintain that the flexible pricing achieved through reciprocity is beneficial, as well as those who argue that such pricing flexibility merely serves to

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[324] Blake, H. M. (1973) Conglomerate Mergers and the Antitrust Laws. *Columbia Law Review* 73, 555-592, p. 569.
[325] Stocking, G. W. and Mueller, W. F., *op.cit.*, pp. 93-94.
[326] Areeda, P. E., Hovenkamp, H. and Elhauge, E. (1996) *Antitrust Law: An Analysis of Antitrust Principles and Their Application*: *Volume X*. Little, Brown and Company, Boston.
[327] *ibid.*, p. 449.

entrench and preserve a collusive oligopolistic pricing structure from breaking down entirely. However, the pricing issue changes complexion entirely when the firms practising reciprocity are market rivals, as is the case in regard to REAs. Any possible benefits arising from more flexible pricing could be thrown into doubt when reciprocity is practiced between market rivals, because it raises suspicion that it could be used to facilitate collusion in order achieve an anti-competitive outcome. A prominent concern raised in regard to REAs is they have served as a mechanism to facilitate co-operation and collusion between market rivals.

4.4 Transaction Cost Approach

Another possible explanation for reciprocity, even when practised amongst market rivals, comes from those who advance a transaction cost approach which provides a rationale for reciprocity under certain specific conditions. Under this approach, reciprocity can facilitate the construction of optimal production facilities which minimise on the associated transaction costs.

Klein, Crawford and Alchian have suggested that one possible explanation for reciprocity could be as protection as a means of mitigating against post-contractual opportunistic behaviour.[328] According to this explanation, an investment in a specialised asset creates quasi-rents which provide the potential scope for opportunistic behaviour. The quasi-rent value of an asset is defined as the excess of its value over its salvage or its value in its next best use to another renter.[329] The potentially appropriable specialised

[328] Klein, B., Crawford, R. G. and Alchian, A. A. (1978) Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *Journal of Law and Economics* 21, 297-326.
[329] *ibid.*, p. 298.

portion of the quasi-rent is that portion, if any, in excess of its value to the second highest-valuing user.[330]

Klein et al. observed that there are two possible means by which to protect against the problem of post-contractual opportunistic behaviour. The first means is to engage in vertical integration by bringing the various stages of the production under common ownership. The second means is through an economically enforceable long-term contract. Long term contracts used as an alternative to vertical integration can be assumed to take two forms:

1. An explicitly stated contractual guarantee legally enforced by the government or some other outside mechanism; or

2. An implicit contractual guarantee enforced by the market mechanism of withdrawing future business if opportunistic behaviour occurs.[331]

Because every contingency could not be cheaply specified in a contract or even known, it was reasoned that transactors will also rely on an implicit type of long-term contract that employs a market rather than legal enforcement mechanism. It was maintained that reciprocity could serve as a market mechanism to protect an implicit contractual guarantee, whereby "[t]he threat of termination of this relationship mutually suppresses opportunistic behaviour".[332]

Klein et al. observed that appropriable quasi-rents exist in regard to specialised assets in the petroleum industry such as oil refineries.

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[330] *ibid.*, p. 298.
[331] *ibid.*, p. 303.
[332] *ibid.*, p. 305.

Expanding on the work of Klein et al., Williamson developed a *hostage model* to explain how long-term trade between rivals is supported by the economic equivalent of hostages in order to protect a dedicated asset.[333] According to Williamson, dedicated assets had certain properties in that they were "discrete additions to generalised capacity that would not be put in place but for the prospect of selling a large amount of product to a particular customer".[334] It was also observed that "dedicated assets lose value if employed in alternative uses (or by or to service alternative users)".[335] It was argued that dedicated assets "are put in place contingent upon particular supply agreements and, should such contracts be prematurely terminated, would result in significant excess capacity".[336]

In the event of the premature termination of the contract by the buyer, it was observed that this "would leave the supplier with a large excess of capacity that could be disposed of only at distress prices".[337] One possible solution to this problem was to require buyers to post a bond to mitigate against the prospect of premature termination. However, this could in turn create a new problem with the possibility that "the supplier may contrive to expropriate the bond".[338] In order to protect buyers against the possibility of expropriation on the part of suppliers, Williamson proposed the introduction of "specialised governance structures that have the purpose and effect of

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[333] Williamson, O. E. (1983) Credible Commitments: Using Hostages to Support Exchange. *The American Economic Review* 73, 519-540.
[334] *ibid.*, p. 532.
[335] *ibid.*, p. 526.
[336] *ibid.*, p. 526.
[337] *ibid.*, p. 532.
[338] *ibid.*, p. 532.

promoting harmonious adaptations and preserving the continuity of exchange relations".[339]

Two possible alternative specialised governance structures were proposed. One was for the establishment of institutions convened by knowledgeable third parties to conduct arbitration between the parties. The other was to expand the nature of the contractual relationship. Under such an arrangement, the buyer and the seller devise a *mutual reliance relation*, whereby the buyer is no longer required to post a hostage as such, but also "invests in specific capital that has value only in conjunction with servicing final demands for the product in question".[340] It was concluded that "reciprocal trading supported by separate but concurrent investments in specific assets provides a mutual safeguard" against the hazard posed by expropriation.[341] Williamson observed that the hostages created through such reciprocal trading arrangements have the property that they are never actually exchanged, with each party retaining possession of its dedicated assets should the contract be prematurely terminated.[342]

Williamson recognised that long-term trading arrangements among nominal rivals could be puzzling and sought to provide an alternative explanation other than that they were engaged in collusion. Following on from both Klein et al. and Williamson, Walters has advanced an efficiency rationale to explain the practice of reciprocity in situations where one or more parties to a transaction may be vulnerable to opportunistic behaviour on the part of

[339] *ibid.*, p. 527.
[340] *ibid.*, p. 528.
[341] *ibid.*, p. 532.
[342] *ibid.*, p. 532.

others.[343] In such situations, Walters observed that "reciprocal trading arrangements may forestall opportunism problems, promote exchange, and enhance efficiency".[344]

Walters proposed that the potential for opportunistic behaviour existed whenever the following three conditions existed:

1. Trading involves specialised investments, the value of which diminishes if the terms of the transactions are altered;

2. There is uncertainty or imperfect information about the future intentions or abilities of a trading partner; and

3. Explicit contracts are ineffectual (perhaps because the necessary contracts are too difficult or costly to specify or to enforce).[345]

The presence of any specialised capital implied some vulnerability to appropriation which a rational trader would seek to avoid by devising means to protect the value of such an asset before creating it.[346] There were several possible solutions to this problem. One solution could be to internalise all functions that might put the firm at risk of opportunistic behaviour, however, this could be excessively costly or impossible in some situations.[347] Another solution could be explicit legal contracts to forestall

[343] S. J. K. Walters (1986) Reciprocity Reexamined: The Consolidated Foods Case. *Journal of Law & Economics* 29, 423-438.
[344] *ibid.*, p. 431.
[345] *ibid.*, p. 431.
[346] *ibid.*, pp. 431-432.
[347] *ibid.*, p. 432.

some types of opportunistic behaviour, however, problems could arise through contract specification and enforcement.[348]

As an alternative to internalisation and contracts, Walters proposed that a self-enforcing market mechanism could be used to prevent opportunistic behaviour and facilitate exchange. One such mechanism was for the posting of collateral by the party or parties with the potential for opportunistic behaviour. It was reasoned that if the value of collateral exceeded the potential gain from opportunism, with the collateral forfeited in the event of a breach in the trading relationship, then such an expenditure would forestall opportunistic behaviour by imposing a cost on the party that failed to hold up its end of the bargain.[349] One mechanism that could be used to generate collateral was reciprocity:

> Reciprocity may generate such collateral. Reciprocal exchange involving specialised capital on both ends may assure the transactors that neither has an incentive to cheat the other since this would result in termination of the trading relationship and a capital loss for the cheating firms as well as the cheated firm.[350]

In order to forestall opportunistic behaviour through reciprocity, Walters believed it was necessary that:

- Both parties post collateral (in the form of relationship-specific investments or sunk costs);

- The amount of collateral is equivalent for each transactor; and

[348] *ibid.*, p. 432.
[349] *ibid.*, p. 432.
[350] *ibid.*, p. 432.

- Each transactor can *cancel* the collateral posted by the other (via termination of the trading relationship) in the event cheating occurs.[351]

However, others have raised the prospect that the transaction cost approach to reciprocity could also be used as a means to enforce discipline within a cartel in order to prevent it from breaking down.

Cavanagh has expressed reservations about the transaction cost rationale for reciprocity, observing that the supposed benefits delivered "would appear to be the same as any cartel would produce".[352] According to Ayres, Williamson's hostage model could be extended to keep firms from breaching their agreement in a cartel arrangement and that "there remain structural settings where credible hostage exchanges may facilitate collusive agreements".[353]

The transaction cost approach provides a strong pro-competitive and productive efficiency enhancing rationale for reciprocity, even in instances where it is practiced between market competitors. Thus, the transaction cost explanation for reciprocity provides a legitimate basis for the existence of REAs. On the other hand, the transaction cost approach could be vulnerable to claims that it is a convenient means through which to impose punishment and enforce discipline amongst a cartel.

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[351] *ibid.*, pp. 432-433.
[352] Cavanagh, E. D., *op.cit.*, p. 647.
[353] Ayres, I. (1987) How Cartels Punish: A Structural theory of Self-Enforcing Collusion. *Columbia Law Review* 87, 295-324, p. 310.

4.5 Conclusion

Several implications emerge from a survey of the academic literature on reciprocity as it relates to the competitive effects of REAs. The presence of market power appears to be a necessary prerequisite before reciprocity is likely to raise any competition issues. Potential competition concerns over the operation of REAs arise not from coercive reciprocity and the leveraging of market power, but from potential market foreclosure and the loss of allocative efficiency. In addition, reciprocity when practised between market competitors, as is the case with REAs, raises suspicion regarding co-operation and the establishment of a cartel arrangement. On the other hand, a transaction cost explanation for reciprocity provides a pro-competitive and efficiency enhancing rationale for the existence of REAs. However, the transaction cost explanation for reciprocity could be vulnerable to claims that it may also serve as a mechanism to punish and enforce discipline within a cartel. Thus, the major competition issues to emerge from the academic literature on reciprocity for the operation of REAs are foreclosure and collusion, as well as the transaction cost rationale. These issues will be further explored in Chapter 5 which will review the literature pertaining to REAs.

Chapter 5: Refinery Exchange Agreements

5.1 Introduction

This Chapter will examine and critically review the literature pertaining to the competitive effects of REAs. The relevant literature consists of a combination of academic literature, the deliberations of courts of law in the United States, and official reports by government agencies amongst predominantly English speaking countries.

This Chapter will determine whether the various rationales put forward as to why REAs are either pro-competitive or anti-competitive are robust and identify what conditions have to be satisfied before REAs are likely to result in an anti-competitive detriment.

REAs were feature of the Australian downstream petroleum industry from at least the mid-1960s until their final abolition in July 2002. According to the Royal Commission on petroleum in 1976:

> the cost of distribution in Australia has led the marketers to distribute by means of product exchange agreements whereunder one company will draw a large part of the product distributed under its name from the refinery of another company.[354]

In 1986 the High Court ruled on a dispute between Ampol and Caltex over the interpretation of a refinery exchange agreement in regard to the supply of leaded petrol between Brisbane and Sydney.[355] Caltex had insisted that Ampol pay a surcharge on the supply of leaded petrol in Sydney after the New South Wales Government had legislated tighter fuel specifications to

[354] Royal Commission on Petroleum, *op.cit.*, p. 46.
[355] *Ampol Ltd v. Caltex Oil (Australia) Pty Ltd* (1986) 60 ALJR 225.

operate in that state by mandating a reduction in the amount of lead in petrol. Caltex had insisted that tighter fuel specifications had added to the cost of production and that this should be reflected by Ampol paying a surcharge for the leaded petrol it received in Sydney. The case turned on whether the leaded petrol exchanged between Ampol and Caltex were 'like' products or not. The High Court decided in a majority decision that the petrol exchanged between Ampol and Caltex were 'non-like' products, thus requiring Ampol to pay the surcharge to Caltex.

The matter of *O'Keeffe Nominees Pty Ltd v BP Australia* in the Federal Court in 1992 involved a private action alleging a breach of section 46 of the TPA. In this matter O'Keeffe Nominees Pty Ltd, the owner of the Matilda Fuels chain of retail service stations in Queensland, brought an action against BP seeking to be supplied with petroleum products on the same terms as the oil majors were supplied in Brisbane under REAs. O'Keefe Nominees Pty Ltd argued that a lack of competition in the downstream petroleum industry was demonstrated by the effect of REAs. However, the matter was not fully heard as the case was settled between the parties.[356]

In the matter of *Mick Skorpos Petrol Discount King v The Shell Company of Australia Limited* that was initiated in December 1995 in the Federal Court, it was alleged that REAs had anti-competitive effects in several downstream petroleum markets in breach of section 45 of the TPA. However, the claims in relation to REAs were struck out during the pleading in February 1997.

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[356] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 2, p. 76.

Walker and Woodward have described REAs operating in Australia in the following terms:

> Where a refiner seeks to compete in a non-home state, it must source its fuel under refinery exchange agreements or import it. Refinery exchange agreements are negotiated for periods of six months, during which the home state refiner's capacity is in large part allocated to supplying specified quantities to each refiner, limiting the amount of discretionary capacity available either to compete in its home state or to export and compete interstate. The non-home state refiner's supply is largely fixed by the refinery exchange agreement for that period, with increased quantities subject to fines or interest payments.[357]

Views and opinions regarding the competitive effects of REAs have been mixed, with most of the interested parties arguing they are either pro-competitive or anti-competitive. The ambiguity and lack of certainty regarding the competitive effects of REAs has prompted Williamson to observe that "[t]he phenomenon of petroleum exchanges has puzzled economists for a long time."[358] Similarly, Scherer has commented that REAs "engender among ostensibly competing companies rich mutual-dependence relationships whose behavioural implications are poorly understood".[359]

In some quarters, it has been argued that REAs foster competition and are therefore efficiency enhancing. This is usually premised on the basis that REAs enable oil refiners to secure product supply in locations geographically distant from their refinery network, thereby allowing them to

[357] Walker, J. and Woodward, L., *op.cit.*, p. 34.
[358] Williamson, O. E., *op.cit.*, p. 533.
[359] Scherer, F. M., *op.cit.*, p. 120.

participate and compete in locations where they might otherwise choose not to do so, as well as save on transportation costs of hauling product from their refinery to a geographically remote location.

Another pro-competitive rationale for the existence of REAs which has been postulated is that the bilateral nature of the trading arrangement minimises on the associated transaction costs. Under Williamson's hostage model, the reciprocal nature of the trading relationship under REAs ensures that transaction costs are minimised through mitigating against the prospect of post-contractual opportunistic behaviour.

On the other hand, there are those who have argued that REAs are anti-competitive based on three principal concerns. The first concern is that REAs facilitate an exchange of information between competitors. The exchange of information which occurs as a result of REAs could be considered as a facilitating practice which makes it easier for parties to collude. The absence of reliable information has been recognised as one of the factors likely to lead to the breakdown of a collusive agreement. REAs may therefore ensure sufficient information flows between rivals to build trust and ensure stability amongst parties to a collusive agreement.

The second concern is that REAs may enable oil refiners to constrain the amount of product received by their rivals, and thereby achieve a market sharing outcome. It has been recognised that one of the most effective means to ensure the stability amongst parties to a cartel is to control the output of cartel members. REAs enable an oil refiner to exert influence over

how much product its rival refiners have available to supply in a particular location.

The third concern is that REAs can limit competitors or even foreclose on potential competitors from participation in the market. For example, an independent wholesaler may be unable to secure product supply due to the operation of REAs and is thus excluded from the market.

Those who maintain that REAs are anti-competitive conclude that they ultimately put upward pressure on product prices. On the other hand, those who assert that REAs are pro-competitive and efficiency enhancing conclude that they put downward pressure on product prices.

Bertrand, who concluded that REAs were anti-competitive, asserted that they were entered into with the express purpose of maintaining upward pressure on retail prices as well as to reduce the number of retail participants competing on the basis of price.[360] Similarly, the Attorney General of Hawaii maintained that REAs were instrumental in fostering co-operative behaviour amongst refiners participating in the Hawaii retail markets as opposed to competitive conduct, thus resulting in higher retail prices than would otherwise be the case.[361]

The TPC first raised concerns regarding the competitive effects of REAs in relation to the 1995 merger between Ampol and Caltex. The TPC listed REAs as the first feature giving rise to concerns about the competitive

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[360] Bertrand, R. J. (1981) *The State of Competition in The Canadian Petroleum Industry: Volume V – The Refining Sector*. Director of Investigation and Research Combines Investigation Act, Canadian Government Publishing Service, Hull, Quebec, p. 105.
[361] Hawaii, Department of Attorney General (1994) *The Attorney General's 1994 Interim Report on the Investigation of Gasoline Prices*. Honolulu.

nature of the downstream petroleum industry followed by other horizontal arrangements such as joint terminalling.[362] In 1996, Walker and Woodward (two then employees of the ACCC) asserted that REAs along with joint terminalling and borrow and loan arrangements provided the means through which the oil majors could engage in tacit collusion in regard to petrol prices and output.[363]

In its 1996 review of wholesale petrol price regulation, the ACCC commented that REAs along with borrow and loan arrangements and joint terminalling "may have potentially anti-competitive effects" and that it needed to be convinced that these arrangements did not breach the TPA.[364] The ACCC inferred that these arrangements should be subject to authorisation under the TPA. The ACCC also committed itself to a further examination of the competitive effects of REAs along with borrow and loan agreements and joint terminalling, and made its support for the deregulation of wholesale petrol prices conditional on its concerns regarding these horizontal arrangements being addressed.[365] The ACCC continued to query the competitive effects of REAs up until 2000, even going so far as to infer that cheaper retail petrol prices could result from the termination of REAs in 1998.[366]

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[362] Trade Practices Commission (1995) Ampol Caltex Merger 'Likely to Breach Trade Practices Act'. *Media Release*, 2 February.
[363] Walker, J. and Woodward, L., *op.cit.*, p. 34
[364] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 31.
[365] Australian Competition and Consumer Commission, ACCC recommends end to petrol declaration.
[366] Fels, A. (1998) Competition Not Regulation is in Consumers' Best Interests. *Motoring Directions* 4(2), 16-22, p. 19.

Although the ACCC had arrived at a mostly negative assessment on the operation of REAs in 1996, by 2002 it had reached an entirely different conclusion. In 2002, the ACCC expressed the view that the cancellation of REAs in Perth and Melbourne may have been a significant contributing factor leading to higher retail fuel prices in those cities.[367]

The Monopolies and Mergers Commission of the United Kingdom (MMC) concluded that as REAs enabled wholesalers to operate extended supply networks, that their overall impact was to improve, rather than restrict, the competitive process.[368] Presumably, this probably means that the MMC believed that REAs put downward pressure on product prices.

Rose, who concluded that REAs were unambiguously pro-competitive, predicted that replacing them with conventional supply contracts "is likely to result in a substantial lessening of competition *for* the market for refined petroleum products in Australia".[369]

Several other parties have given more guarded and qualified support for the competitive benefits delivered through REAs, while acknowledging their potential to facilitate anti-competitive conduct.

5.2 REAs Facilitate Competition and are Efficiency Enhancing

Numerous parties have contended that because REAs enable oil refiners to participate in geographic markets far removed from their own oil refinery

[367] Australian Competition and Consumer Commission, *Terminal gate pricing arrangements in Australia.*
[368] Monopolies and Mergers Commission (1990) *The Supply of Petrol: A Report on the supply in the United Kingdom of petrol by wholesale.* Her Majesty's Stationary Office, London, p. 290.
[369] Rose, J. (1999) The ACCC and the Market Power of the Oil Majors – Part 2. *Trade Practices Law Journal* 7, 74-87, p. 87.

locations, that they must be pro-competitive because they allow more rivals to participate in a market than might otherwise be the case. This is because REAs enable a refiner to be supplied in a distant location from their refinery at their own cost of production whilst avoiding transportation costs from their refinery. The cost of transportation for a refiner from their refinery to another geographic market could be prohibitively expensive and may prevent a refiner's participation from a particular geographic market. Hence, REAs may increase market participants while reducing transportation costs and eliminating the need for refiners to engage in the unnecessary cross-hauling of product. A further advantage attributed to REAs is that it prevents the need for refiners to build, maintain and operate a refinery within the vicinity of each geographic market in which they operate and thus prevents the proliferation of small inefficient refineries unable to fully capture the benefits of economies of scale available from oil refining.

The earliest found expression for the view that REAs are pro-competitive because they enable more parties to participate in a market than might otherwise be the case is contained in the US court decision of *Blue Bell Co. v. Frontier Refining Co.* where the court opined that:

> The underlying purpose and effect of the exchange agreements are too plain for doubt. In the first place, they were obviously entered into in order to facilitate competition, not stifle it. They permitted one marketing company to do business at the back door of its competitor's refinery by the exchange of manufactured products.[370]

[370] *Blue Bell Co. v. Frontier Refining Co.* 213 F.2d 354 (10th Cir. 1954).

In the US court decision of *Thomas v. Amerada Hess Corporation*, it was argued that the consequences of prohibiting REAs would be to turn the areas surrounding each refinery into a natural monopoly where only the owner of that refinery could economically afford to compete and that competition would be confined to fringe areas between two refineries.[371]

Several parties have contended that REAs are pro-competitive simply because they may increase the number of market participants. In its report on the supply of petrol in the United Kingdom, the MMC argued that there was a clear benefit served by REAs because they increased the number of market participants in a particular locality, which should in turn increase competition, help keep prices down, and improve the quality of service.[372] Similarly in Australia, the Industry Commission concluded that REAs had facilitated competition between all of the refiners in most of Australia's larger geographic markets and that in their absence, refiners may choose not to compete in those markets furthest removed from their refineries.[373]

Commenting on the operation of REAs in the United States, Ritchie argued that they allowed refiners to compete vigorously across the country while lowering transportation costs.[374] According to Ritchie, the lower transportation costs would ultimately be translated into lower costs to consumers.[375] Similarly, Renfrew argued that a refinery exchange agreement between refiners with refineries operating in different locations

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[371] *Thomas v. Amerada Hess Corporation*. 393 F.Supp. 58 (M.D. Pa. 1975).
[372] The Monopolies and Mergers Commission, *op.cit.*, p. 289.
[373] Industry Commission, *op.cit.*, pp. 55-56.
[374] Ritchie, S. (1976) Petroleum Dismemberment. *Vanderbilt Law Review* 29, 1131-1165, pp. 1144-1145.
[375] *ibid.*, p. 1145.

put each of them in competition with the other while delivering a substantial saving on freight costs.[376]

Flaim queried whether the only viable alternative for a refiner to compete in a location far removed from their own refinery was to transport product across from their refinery.[377] Although Flaim believed that REAs were preferable to the cross-hauling of product, she commented that it was not entirely clear whether they were more efficient than a market where parties had to bid openly for the supply of refined product.

Williamson has argued that if REAs could only be justified on the basis of transportation cost savings brought about through the avoidance of cross-hauling, then the same benefits could also be generated through unilateral trade as well:

> The usual argument that exchanges are justified because they avoid costly cross-hauling ... is not an adequate justification for widespread use of exchanges. Were it only that transportation cost savings were realised, unilateral trading would suffice.[378]

In Williamson's opinion, failure to address why bilateral trading arrangements through REAs were more beneficial than unilateral trade left the agreements vulnerable to suspicion that they were a preferred form of contracting for ulterior motives.

The Restrictive Trade Practices Commission of Canada (RTPC) saw it as desirable that REAs enabled refiners to obtain product for their retail

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[376] Renfrew, C. B. (1993) Intercompetitor Co-operation in the Petroleum Industry. *Antitrust Law Journal* 61, 559-577, p. 569.
[377] Flaim, T. (1979) The Structure of the U.S. Petroleum Industry: Joint Activities and Affiliations. *The Antitrust Bulletin* 24, 555-572.
[378] Williamson, O. E., *op.cit.*, p. 532.

operations in markets distant from their refineries without having to transport the product because of the real-cost savings realised in transportation.[379] It also contended that the participation of refiners in markets distant from their own refineries could enhance competition in those markets. However, the RTPC rejected several reasons advanced for the existence of REAs, including the reduction in transportation costs, lower unit costs and the promotion of competition in distant markets on the basis that such benefits were also available through unilateral trading arrangements as well.

In a similar vein, the MMC did not accept the argument that the only alternative to REAs was for companies to transport product from its own supply source. Instead, it maintained that in the absence of REAs, similar transport cost savings would be achieved through other means such as normal market transactions.[380]

Courts in the United States have identified another possible adverse consequence in the event that REAs were curtailed. It has been argued that the cancellation of REAs would result in a refiner establishing and operating a refinery in each location in which they engaged in retailing, thus resulting in the needless duplication of refining capacity and the proliferation of sub-economic production facilities unable to take advantage of the significant economies of scale available in oil refining. In *Thomas v. Amerada Hess Corporation*, the court concluded that:

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[379] Restrictive Trade Practices Commission (1986) *Competition in the Canadian Petroleum Industry*. Canadian Government Publishing Centre, Supply and Services Canada, Ottawa.
[380] The Monopolies and Mergers Commission, *op.cit.*, p. 289.

> Outlawing the exchange agreements would have a tendency to bring about a needless duplication of refineries with their accompanying drawbacks.[381]

Similarly, in *American Oil Company v. McMullin* the court opined that:

> The arrangement is for the obvious purpose of avoiding the need for each company to maintain a refinery in each geographical area in which it operates.[382]

On the same theme, Flaim recognised REAs could enable firms to reduce the total costs of petroleum acquisition and distribution "because a refinery may expand its capacity and have greater refining capacity than is needed to supply its own [retailing] operations" due to the large economies of scale available in refining.[383]

The Bertrand Report on competition in the Canadian petroleum industry also recognised the efficiency enhancing benefits arising from REAs.[384] This was because REAs enabled the more fulsome exploitation of economies of scale at the refinery level than would otherwise be the case if each market participant had to establish their own refinery within a particular geographic market, while not limiting the retail market to only those participants with refinery capacity in the immediate vicinity.

Several pro-competitive and efficiency enhancing benefits arising from the operation of REAs have been identified. However, the critical flaw in these arguments in support of the supposed benefits of REAs is that they ignore

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[381] *Thomas v. Amerada Hess Corporation, op.cit.*
[382] *Amercian Oil Company v. McMullin.* 508 F.2d 1345 (1975).
[383] Flaim, T., *op.cit.*, p. 560.
[384] Bertrand, R. J., *op.cit.*

exactly the same kinds of benefits can also be delivered through unilateral trading arrangements as well. Hence, these supportive arguments in favour of REAs fail to identify why they are a superior and preferred form of contracting to unilateral trade. The next section will examine possible rationales that have been advanced as to why REAs are a superior form of contractual arrangement as compared to unilateral trade.

5.3 The Benefits of Bilateral Trade

In the previous section it was concluded that all of the identified benefits achieved from REAs could also be delivered through unilateral trade as well. This section examines possible rationales as to why bilateral trading arrangements through REAs may be a superior form of contracting compared to unilateral trading arrangements.

The MMC has contended that there could be some marginal cost imposition if the downstream petroleum industry was forced to abandon REAs in favour of other contractual arrangements. According to the MMC, any alternative form of contracting to REAs "could well be more complex in administrative terms and would have a small cost penalty without producing any particular benefit for the consumer".[385]

Williamson believed that long-term trade between rivals, as is the case under REAs, was only feasible if certain conditions were satisfied.[386] First, the product in question had to be fungible with Williamson observing that fungibility is not true for many differentiated goods and services.[387] Second,

[385] The Monopolies and Mergers Commission, *op.cit.*, p. 289.
[386] Williamson, O. E., *op.cit.*
[387] *ibid.*, p. 531.

efficiency incentives for long-term trade between rivals depended upon "prospective realisation of production cost savings".[388] For this to occur, economies of scale had to be large in relation to the size of geographic markets. If economies of scale was not an issue, it was argued that "every firm would presumably supply everywhere to its own long-term needs".[389] However, in those instances where economies of scale are significant, it was reasoned that "each market will support only a limited number of plants of minimum efficient size".[390] Third, it was necessary for firm-specific effects to extend across geographic boundaries. It was argued that fungibility and scale economies did not by themselves establish the feasibility of long-term trade between rivals in order to deliver gains from trade. For this to occur, the value of identical product sold by rivals had to exceed that sold by the local supplier, and this was only going to occur where firms "possess valued reputations that extend beyond their local market to include distant markets".[391]

Williamson proposed a hostage model to explain the existence of REAs, whereby long-term trade between rivals is supported by the economic equivalent of hostages in the form of a dedicated asset. Reciprocity in this instance serves to equalise the exposure of the parties, thereby reducing the incentive of the buyer to defect from the exchange.[392] In the absence of such reciprocity, the supplier would be forced to redeploy dedicated assets at a

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[388] *ibid.*, p. 532.
[389] *ibid.*, p. 532.
[390] *ibid.*, p. 532.
[391] *ibid.*, p. 532.
[392] Williamson, O. E. (1989) Transaction Cost Economics. In Schmalensee, R. and Willig, R. D. (eds.) *Handbook of Industrial Organisation*. Vol. 1, Elsevier Science Publishers B. V., Amsterdam, p. 162.

greatly reduced alternative value.[393] The buyer's commitment to the exchange is thus signalled by their willingness to accept reciprocal exposure of a dedicated asset, thereby mitigating against the hazards of defection.[394]

Under Williamson's hostage model, "long-term exchange agreements permit firms to secure product in geographic markets where own-production is not feasible because economies of scale are large in relation to their own needs".[395] Thus under such conditions, it was reasoned that firms with whom exchange agreements are reached will construct and maintain larger plants than they otherwise would.[396]

The RTPC accepted two reasons as to why REAs were a preferred form of contracting over unilateral trade: first, an improved degree of security; and second, the possibility for improved terms of trade. The RTPC accepted the premise that REAs provided an additional measure of security over and above that of an ordinary contract. That security was the ability to act promptly in response to a supply interruption on the part of the other party without waiting to resolve disputes about fault or legal entitlement.[397] According to the RTPC, this extra measure of security was achieved through each party holding the other one hostage, facilitating long-term planning by making long-term volumes and supply prices more predictable, and constituted a cost saving.[398]

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[393] *ibid.*, p. 162.
[394] *ibid.*, p. 162.
[395] Williamson, O. E., Credible Commitments: Using Hostages to Support Exchange, p. 535.
[396] *ibid.*, p. 535.
[397] Restrictive Trade Practices Commission, *op.cit.*, p. 233.
[398] *ibid.*, p. 233.

The RTPC maintained that a hostage argument is strongest where transportation is a viable alternative to REAs. The fact that transportation is economically feasible means that the refinery supply-and-demand balance is likely to be similar in the market areas covered by the agreement. In a situation where the supply-and-demand balance in the affected markets is asymmetrical, the RTPC contended that the hostage argument breaks down. It argued that a supplying firm in a market where there is high capacity utilisation and relatively high wholesale prices might find it advantageous to break the agreement.[399] This would depend on how much lower the wholesale prices in the other market were, where it would have to pay to obtain supplies, in comparison to wholesale prices it could obtain by selling the same volume in the market in which it possessed a refinery. Thus, if there is a significant price differential, it may be advantageous and profitable for a refiner to withdraw from REAs.

Rose contended that REAs constitute a superior form of contractual arrangement because they generated transaction cost savings.[400] According to Rose, transaction costs include the costs of discovering the relevant market prices, negotiating, and enforcing contracts and that REAs served to reduce these transaction costs.[401]

Following on from Williamson's hostage model, Rose maintained that REAs lower transaction costs due to the problems associated with asset specificity. Rose argued that specialised assets are vulnerable to opportunistic behaviour on the part of others unless other contracting parties

[399] *ibid.*, p. 233.
[400] Rose, J. *op.cit.*
[401] *ibid.*, pp. 80-81.

also have their own specialised asset at risk as part of the contractual relationship:

> Specialisation (that is, the emergence of relationship-specific investments) prevents the other party from walking away without loss. Asset specialisation creates openings for opportunistic behaviour in which one party to the relationship manoeuvrers to extract wealth from the other; and that wealth is wealth that could not be extracted in the absence of the interdependence. Specialised assets are vulnerable to hold-ups. When one party to the relationship refuses to pay the other party more than the highest value of the specialised asset elsewhere, we have a hold-up.[402]

One means of overcoming the problem of asset specificity is for the vertical integration of ownership of refineries with retail distribution networks within the one firm, as this would "remove the risk to the refiner of a sudden costly drop in throughput when a distributor cancels a contract or otherwise varies the quantity demanded".[403] In the absence of vertical integration, Rose maintained that specific assets can be protected from opportunistic behaviour through credible commitments; the posting of a bond or an equivalent forfeitable asset against malperformance.[404]

Rose asserted that economies of scale in refining require that a large amount of product must be sold through the retail networks of competing refiners, otherwise no refiner could sell sufficient quantity of petrol through their own retail network to justify building a refinery.[405] However, Rose argued that once a refinery is actually constructed, other refiners would be in a

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[402] *ibid.*, pp. 81-82.
[403] *ibid.*, p. 82.
[404] *ibid.*, p. 82.
[405] *ibid.*, p. 82.

strong bargaining position because the investment is then sunk. Such conditions leave a refiner vulnerable to opportunistic behaviour, whereby a contrived termination of a conventional contract or even a small reduction in quantity demanded would leave the refiner exposed and perhaps forced to sell at distress prices.[406]

The scope for post-contractual opportunistic behaviour is reduced by REAs which are facilitated by comparable asset investment. This leads Rose to conclude that REAs are "simple, self-enforcing contracts".[407]

Other interpretations have also been offered for the bilateral nature of REAs of a more sinister nature. These have suggested REAs are a possible means through which to enforce discipline amongst members of a cartel.

Bertrand contended that participation in a refinery exchange agreement was made dependent on the payment of an entry fee, namely the investment in refining capacity.[408] Through this mechanism, it was argued that the behaviour of a refiner could be conditioned against pursuing aggressive pricing strategies, as a refiner would be more vulnerable and suffer greater losses in the event of retaliatory predatory pricing because of the significant fixed costs associated with a refinery investment.[409]

Ayres has suggested that Williamson's hostage model could be extended to facilitate horizontal cartel agreements.[410] This would be achieved through increasing the ability of the cartel to punish members for any deviation from

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[406] *ibid.*, p. 83.
[407] *ibid.*, p. 83.
[408] Bertrand, R. J., *op.cit.*
[409] *ibid.*, p. 55.
[410] Ayres, I., *op.cit.*

the agreement. Through means of a refinery exchange agreement, Ayres contends that cartel members could inflict targeted punishments by refusing to exchange product with a firm breaching the agreement.[411] Thus, the breaching firm would be punished by its creation of unused excess refining capacity and by not being able to use its capacity to supply unanticipated short-falls in other markets.[412]

Potential transaction cost savings provide a justification as to why bilateral trading arrangements through REAs may be a superior form of contracting arrangement and preferred over the alternative of unilateral trade. On the other hand, the nature of bilateral trading arrangements through REAs is open to other interpretations and vulnerable to claims that it could also be used to facilitate a collusive agreement, whether that be tacit or overt. The next three sections will examine arguments advanced as to why REAs could facilitate anti-competitive conduct.

5.4 Information Exchanges

The exchange of information between market rivals could be considered as a facilitating practice which makes it easier for parties to collude in some form. Such an exchange of information has been recognised as a critical factor for monitoring the compliance of members to a cartel agreement. Without such a flow of information, co-operation might otherwise breakdown. Concern has been expressed that REAs facilitate the exchange of information that enables oil refiners to co-ordinate their conduct in such a manner as to form and maintain a stable cartel agreement.

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[411] *ibid.*, p. 310.
[412] *ibid.*, p. 310.

One of the two principal reasons why Bertrand concluded that REAs were a co-ordinating mechanism, which enabled oil refiners to engage in collusive conduct, was because of the information exchanges they engendered.[413] Bertrand contended that the detailed information exchanges facilitated through REAs helped to maintain stability and build-up trust between members of a cartel in Canada:

> Product arrangements involved detailed exchanges of information among companies at the refinery level. An oligopoly's stability is inversely related to the information available to each of its members about the respective strategies of the other. Solidarity and the maintenance of oligopoly discipline depend upon the trust that develops among members. Trust is engendered if information about each member's activities is so detailed that individual companies can be certain that others are abiding by the oligopoly's rules. Comprehensive exchanges of information among companies at the refinery level provided what was required for this purpose. In turn, the exchanges of product provided a monitoring device as to the accuracy of this information.[414]

Bertrand further contended that the information flows generated by REAs could also be used with the intention of discovering information regarding a competitor's intentions. Bertrand maintained that this information could in turn be used to anticipate and thwart competition in the retail sector. Hence, the information flows brought about through REAs could be used to manipulate and condition refiners against engaging in competitive conduct.

However, Bertrand recognised that the information exchanges generated through REAs could also be efficiency enhancing while not necessarily

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[413] Bertrand, R. J., *op.cit.*
[414] *ibid.*, pp. 3-4.

deleterious to competition. This would be the case if they allowed for the greater exploitation of economies of scale at the refinery level than would otherwise be the case if each refiner had to establish a refinery within a particular geographic market, while not limiting the retail market to only those participants with refinery capacity in the immediate vicinity:

> some industry communications might be regarded as a necessary by-product of a process that prevents the massive economies of scale that exist at the refining level from causing a similar level of concentration to develop in [retailing]. Therefore inter-refinery product trades and the accompanying exchange of information need not be harmful to competition.[415]

However, Bertrand concluded that the information exchanges in Canada brought about through REAs had gone a lot further than merely to exploit economies of scale and had in fact served to reduce competition.

On the other hand, Williamson was scathing in his assessment of Bertrand's contention that the information exchanges engendered through REAs assisted in the facilitation of anti-competitive conduct.[416] Williamson dismissed Bertrand's contention on the basis that exactly the same sort of information exchange would occur in the event of a unilateral trade. On this basis, Williamson concluded that Bertrand's objection was fundamentally flawed because it provided the basis to oppose any long-term trading arrangement.

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[415] *ibid.*, p. 4.
[416] Williamson, O. E., *op.cit.*, p. 533.

The RTPC largely dismissed concerns that REAs facilitated an information exchange resulting in collusive conduct for several reasons.[417] In the first instance, it argued that "a great deal of information, some of it specific and some general, will inevitably be known by each firm about each of its competitors and about the industry as a whole" through a range of publicly available sources, and hence "each firm quite properly knows a fair amount about each of its competitors' refineries".[418] Through this channel, the RTPC maintained that "short-term and long-term industry demand and supply forecasts abound".[419] In the second instance, the RTPC argued that in terms of specific information exchange, it is just not possible to negotiate the terms of a supply agreement "without discussing the volumes to be supplied, product specifications and times and locations of transfer".[420] On this specific point, it concluded that provision of this type of information is unavoidable and does no harm to competition.[421] Overall, the RTPC was dismissive of suggestions that the information exchanges engendered by REAs uniquely facilitated collusive conduct because exactly the same sort of information would have been exchanged during the course of unilateral trading as well.

The FTC has also specifically considered the issue of whether the exchange of information facilitated by REAs engenders collusive conduct amongst oil refiners.[422] While recognising that substantial communication and the

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[417] Restrictive Trade Practices Commission, *op.cit.*
[418] *ibid.*, p. 235.
[419] *ibid.*, p. 235.
[420] *ibid.*, p. 235.
[421] *ibid.*, p. 235.
[422] Federal Trade Commission (2001) *Final Report of the Federal Trade Commission Midwest Gasoline Price Investigation*. Washington DC.

exchange of information between competing refiners involved in the negotiation of REAs could facilitate collusion, the FTC concluded that such exchanges of information actually helped the market to function efficiently by allowing for the greater exploitation of economies of scale than would otherwise be the case if each refiner had to establish a refinery in each geographic market in which they sought to participate. Furthermore, the FTC found no evidence of collusion in regard to the operation of REAs.

While the exchange of information between competitors is generally a necessary condition to ensure the maintenance and stability of a cartel, its mere existence does not provide sufficient grounds to conclude that collusion and anti-competitive conduct is actually occurring. Concerns raised in relation to the information exchanges that occur as a result of REAs could also be raised in relation to unilateral trading arrangements as well. There appears to be nothing unique about the information flows generated by REAs as to why they should facilitate collusion and anti-competitive conduct any more so than unilateral trading arrangements. Thus, the grounds for concluding that REAs are anti-competitive on the basis of the information flows they engender would appear to be weak.

The next two sections examine some of the more substantive reasons put forward as to why REAs could be considered as anti-competitive.

5.5 Market Sharing and Price Fixing

Arguably, a more serious charge levelled against REAs is that they allow a refiner to constrain the amount of product available to a rival refiner in a particular geographic market. Competition concerns arise from the ability of

a refiner to restrict the amount of product that a rival has available to sell, which in turn could inhibit and condition refiner wholesale and retail market participants against engaging in competitive conduct, as well as serve as an overt act or a *de facto* means to achieve a market sharing arrangement between wholesale and retail market participants. It has been recognised that the ability to fix market shares is one of the most effective means to enforce discipline and compliance upon members of a cartel. The ability to fix market shares is an effective alternative means of achieving the same outcome as facilitated through a price fixing arrangement.

Bertrand asserted that REAs in Canada had been used "to create a form of market-sharing arrangement between firms".[423] This was achieved because of the reciprocal nature of REAs. This meant that any attempt by a rival refiner to compete for market share in a location far removed from their refinery, and thereby raise the amount of product received under the agreement, would immediately be countered and matched by the other refiner receiving the same amount of additional product in the location of the original refiner's refinery. Through this mechanism, Bertrand contended that REAs imposed an immediate discipline and restraint against refiners from engaging in competitive conduct:

> Reciprocal agreements specified that the amount of products lifted by each company from the other's refinery would be approximately the same. These arrangements, therefore fixed the relative market shares in the sense that neither firm could expand in the territory of the other and increase its share of both markets. If a company began to increase the amount of product it took from the other in the

[423] Bertrand, R. J., *op.cit.*, p. 569.

> latter's home territory and, in turn, adopted an aggressive pricing policy for marketing purposes, it knew the terms of the exchange would facilitate immediate retaliation. ... In the case of reciprocal arrangements, the partner losing market share in his home market would have the right to increase its product liftings from its partner and to create immediately a similar price deterioration in the home market of the firm which initiated price competition. Reciprocal agreements, therefore, were an extremely effective instrument for solving the discipline problem any oligopoly must face in that they decreased the reaction time needed to counter aggressive behaviour.[424]

The Attorney General for the US state of Hawaii also arrived at the conclusion that REAs resulted in a market sharing arrangement.[425] According to the Attorney General, REAs acted to entrench the existing market share of incumbent participants in Hawaii's wholesale markets. This was achieved by dividing the market for product among the incumbents according to the incumbent's projected needs, which were based on the incumbent's historic market shares.

Through limiting the supply of product available in Hawaii to that manufactured in Hawaii, the Attorney General concluded that REAs had acted in such a manner as to keep the market price artificially high. The Attorney General further concluded that REAs became the mechanism through which incumbents kept low-priced product out of Hawaii and prevented it from being imported from the US mainland.

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[424] *ibid.*, p. 3.
[425] Hawaii, Department of Attorney General., *op.cit.*

The Attorney General asserted that Hawaii markets were worth competing for, arguing that it is worth engaging in vigorous price competition in an oligopolistic market in the event that a seller can project a profitable outcome from a substantial price reduction. This would occur where a seller could expect price competition to increase profits if a price decrease would increase sales more than enough to make up for the loss of margin due to the decrease in price.

The Attorney General reasoned that a seller's price decrease in an oligopolistic market would ordinarily be matched by other sellers in order to preserve their market share, but that a price decrease would increase sales if other sellers could not match it because they were less efficient, and if the first seller could supply the entire market at the lower price. It was observed that three companies who were party to REAs, but did not have refining capacity in Hawaii, possessed sufficient refining capacity on the US mainland to manufacture enough petrol to supply the entire demand of the Hawaii markets.

The Attorney General suggested that if one of the three US mainland refiners which wholesaled product in Hawaii was to reduce its wholesale price to the price of wholesale petrol in Los Angeles plus the cost of transportation, then it would be unlikely that the two Hawaii based refiners would continue to sell to such a hostile seller. Under such a scenario, it was argued that the seller would have to bring its own supplies over from the US mainland provided it was profitable to do so. On this basis, the Attorney General asserted that the critical question ultimately came down to whether

or not it was possible to import petrol into Hawaii for less than the cost of production in Hawaii. On the basis that it was possible to import petrol at a lower cost than it took to manufacture it in Hawaii, the Attorney General reasoned that there must be another factor which precluded this from occurring.

A review of the analysis undertaken by the Attorney General was conducted by the Bureau of Competition of the FTC (BOC). The BOC did not concur with the Attorney General's analysis, commenting that it did not believe that it was clear enough that REAs had been entered into for the express purpose and with the effect of maintaining the price of petrol in Hawaii. At best, the BOC argued, maintaining the market price was an incidental effect. The BOC did not share the view of the Attorney General that participants in a refinery exchange agreement used them in order to divide up the market between them.

The BOC also believed that it would be difficult, if not impossible, to prove that REAs have any actual anti-competitive effects in Hawaii. The BOC maintained that even in the event that REAs were eliminated, that it would not necessarily lead to lower petrol prices. In the event that REAs were banned, the BOC believed that non-refiner incumbents would pursue one of three options: to either seek to displace the two Hawaii refiners; abandon the Hawaii markets altogether; or buy petrol from the two Hawaii refiners on the open market.

The BOC reasoned that the decision by one of the non-refiner incumbents to go after the market share of the two incumbent Hawaii refiners was most

unlikely on the basis that if such a move were resisted by one or both of the incumbent refiners, the ensuing price war would result in all participants losing out. The BOC further maintained that the final outcome would still be a market structure that was characterised as being oligopolistic if not a monopoly.

The Attorney General was not entirely satisfied with the analysis conducted by the BOC, arguing that the absence of vigorous price competition implied an attitude of co-operation amongst incumbent oil companies in Hawaii. The Attorney General blamed REAs for sustaining this attitude of co-operation.

In the final analysis, the Attorney General decided that the answer as to the competitive effects of REAs ultimately rested on whether or not incumbent participants in the Hawaii markets earned excessive profits or not. It was reasoned that if excessive profits were being earned in Hawaii, then in the normal course of events this should attract new entry into Hawaii in the absence of REAs.

A professional economist was engaged to determine whether the incumbent oil companies in Hawaii had been earning profits in excess of competitive levels. The economist concluded the facts tended to indicate that the refineries in Hawaii had not been earning more than a competitive return on investment. However, the economist drew attention to one dilemma. This was the finding that it would probably have been cheaper to import petroleum products from Los Angeles into Hawaii, even after taking

account of transportation costs, rather than continue to manufacture in Hawaii.

In Australia, several parties have also recognised that the ability of a refiner to constrain the amount of product available to a rival could be used to inhibit and/or stifle competitive conduct. The Industry Commission acknowledged that REAs could be used to restrict competition even though it concluded, on balance, that REAs were pro-competitive.[426] The Industry Commission recognised that REAs could impede the expansion of a refiner in a geographic location remote from its refinery. In this case, expansion for a refiner would depend on convincing a rival refiner to take up more volume to expand sales from its refinery in another market or to undertake the more costly option of importing product from either interstate or overseas. The Industry Commission concluded that the potential for agreements to limit competition was smaller the greater the amount of flexibility allowed to vary volumes and the opportunity to purchase product rather than exchange it.

Walker and Woodward lumped REAs in with a number of other co-operative arrangements between the oil majors in Australia, which they maintained had facilitated collusive conduct.[427] REAs were seen as a means by which refiners could punish and discipline other refiners for breaking cartel solidarity:

> the industry is also characterised by refinery exchange agreements, joint terminalling and borrow and loan arrangements. These

[426] Industry Commission, *op.cit.*, p. 55.
[427] Walker, J. and Woodward, L., *op.cit.*

> agreements, and the inter-dependence that they create, facilitate output co-ordination between the majors and provide a means of punishing deviations from co-ordinated prices and outputs. The refinery exchange agreements constrain the supply elasticity of all parties and involve costs for supplying in excess of agreed quantities, discouraging cheating on co-ordinated prices and outputs.[428]

Although Williamson put forward his hostage model to provide a pro-competitive and efficiency enhancing rationale for the existence of REAs, he was not oblivious to the possibility that the restraints contained within them could be used to serve other purposes as well, such as a mechanism for strategic market division.[429] This would be the case where the market concerned "exhibited troublesome structural properties" and the requisite preconditions existed for the exercise of market power, such as high market concentration coupled with high barriers to entry.[430] Ayres postulated that Williamson's hostage model could also be extended to enforce compliance and discipline amongst a cartel.[431]

Rose has challenged the contention that REAs could act as a cartel enforcement mechanism.[432] Rose maintained that the cost penalties contained in REAs for unilateral expansion were of little practical significance for competition law and could be simply explained by an upward sloping marginal cost (or supply) curve.[433]

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[428] *ibid.*, p. 34.
[429] Williamson, O. E., *op.cit.*, p. 536.
[430] *ibid.*, p. 536.
[431] Ayres, I., *op.cit.*
[432] Rose, J., *op.cit.*
[433] *ibid.*, p. 77.

Furthermore, Rose argued that if REAs were meant to be a cartel enforcement mechanism, then they would be far more effective if they covered all industry participants, rather than confined to refiners, as cartels could be undermined by any price cutters:

> A strong reason to consider that a refinery exchange is not a cartel enforcement device is the respective attitudes of the majors and independents to new membership. If a refinery exchange were a cartel enforcement mechanism, the majors would be keen to ensure industry-wide coverage. Successful co-ordinated interaction must encircle all significant sellers.
>
> The downfall of many collusive endeavours is smaller firms that stay outside the collusive arrangement and undercut the cartel's price.[434]

The RTPC also examined the question of whether REAs acted to entrench existing market shares by examining the evidence upon which Bertrand had used in drawing his conclusion.[435] After calling into question the nature of the evidence upon which Bertrand had drawn his conclusion, the RTPC commented that:

> Even if reciprocal inter-refinery supply arrangements appear on occasion to amount to a form of geographical specialisation, that by no means implies an arrangement to share markets or to stabilise market shares.[436]

A major determinant in deciding whether or not REAs can act in such a way as to allow a refiner to fix market shares will probably depend on the extent to which it is possible for other wholesale market participants to secure

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[434] *ibid.*, p. 77.
[435] Restrictive Trade Practices Commission, *op.cit.*
[436] *ibid.*, p. 246.

alternative sources of supply from outside a particular geographic market. If it proves to be extremely difficult to obtain product from another source other than a local refiner in a particular geographic market, then it is quite conceivable that REAs could serve as a device for market sharing between participating refiners to the agreement. If on the other hand, importation of product from outside a particular geographic market is relatively easy and inexpensive, then attempts to fix market shares through REAs could fail. Ultimately, the degree to which a geographic market is contestable to imported product will probably determine the potential scope for REAs to achieve a market sharing outcome amongst participating refiners. Even if a geographic market is not contestable to imported product, it certainly does not follow that REAs will definitely be used for market sharing purposes; such a market may only give an indication as to whether or not the potential exists, but only the conduct of the participating refiners in a refinery exchange agreement will determine whether this actually occurs. Hence, geographic markets displaying structural properties that render them relatively uncontestable to outside and imported product are likely to create conditions conducive for REAs to restrict the amount of product available to rivals, which in turn could be used to achieve a market sharing arrangement between participating refiners. On the other hand, if a particular geographic market is not contestable to imported product, then it may also be more profitable for a local refiner to abandon REAs altogether in pursuit of greater profits as suggested by the RTPC (when the rationale behind the hostage model breaks down).

5.6 Market Foreclosure

Closely aligned to the possibility that REAs could be used to achieve a market sharing arrangement is concern that REAs could be used to limit, if not deny outright, the supply of product to independent participants in wholesale and the retail markets. Through this means, REAs could act in such a manner as to foreclose the market to independents, thereby limiting market participation to refiners. Concern has been expressed that with non-refiners excluded or limited in their market participation, refiners will adopt co-operative as opposed to competitive strategies against each other in wholesale and retail markets. Furthermore, concern has also been expressed that non-refiners have been excluded from participating in REAs even when they have sufficient product to exchange, thus making it more difficult for non-refiners to participate in wholesale markets where they cannot secure their own source of product supply.

Probably the first party to suggest that REAs could be used for exclusionary purposes was the FTC. In 1973, the FTC issued a complaint against the eight largest oil companies in the United States alleging that they had combined or agreed to monopolise refining, maintained monopoly power over refining, and maintained a non-competitive market structure in refining in certain regions of the United States.[437] Part of the FTC's complaint focused specifically on the operation of REAs, alleging that the oil companies had exercised market power in the refining of petroleum products by engaging in the acts and practices of:

[437] Federal Trade Commission Docket No. 8934 (1973). This action was eventually dropped in 1981.

> Pursuing a common course of action in participating in restrictive or exclusionary exchanges and sales of [petrol] and other refined petroleum products among themselves and with other petroleum companies.[438]

The ACCC has expressed concern that REAs could be used to stifle the participation of independents in the retail market.[439] This was argued on the basis that independents would only have access to any residual product that a refiner had left-over after all a refiner's obligations under REAs had been honoured.[440] Furthermore, the ACCC expressed concern that the expansion of independents could be constrained in regions of tight supply.[441] Another concern raised by the ACCC was that refiners excluded the participation of independents from REAs, even where independents had product to exchange.

Several participants to the Industry Commission inquiry also referred to the exclusionary effects of REAs.[442]

The RTPC also examined claims that REAs put the squeeze on the amount of product available for non-vertically integrated companies to purchase.[443] The RTPC Report was not able to reach a definitive opinion on this question and concluded that concerns regarding a supply squeeze for non-refiners were not able to be substantiated.

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[438] *ibid.*
[439] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1.
[440] *ibid.*, p. 24.
[441] *ibid.*, p. 24.
[442] Industry Commission, *op.cit.*, p. 55.
[443] Restrictive Trade Practices Commission, *op.cit.*

The MMC also considered whether REAs had any exclusionary effects in limiting the ability of non-refiner wholesalers to access product.[444] The MMC dismissed concerns that REAs had any exclusionary effects by arguing that any wholesaler with sufficient quantity of product to trade should be able to participate. It should be noted that out of the three non-refiners able to participate in REAs at the time the MMC considered the matter, two had substantial refining capacity elsewhere in Europe and the other had acquired the wholesale fuels business of a manufacturer which produced petrol through a blending process.

Rose has queried the ACCC's finding that REAs were restricted to refiners.[445] Rose drew on the finding of the MMC which found that non-refiners were able to participate in REAs in the United Kingdom, in contrast to the ACCC's finding in respect to Australia.[446] However, Rose failed to recognise that all of the non-refining wholesalers allowed to participate in REAs in the United Kingdom had access to their own manufactured source of supply. As was the case in Australia, there was no participant to REAs in the United Kingdom who was not a manufacturer of petroleum products.

Rose was also critical of the ACCC's concerns that REAs made new entry more difficult, and drew attention to ACCC comments that new entry was made "more difficult due to savings on cross-hauling arising from the refinery exchanges".[447] It was argued that the superior efficiency achieved by refiners by virtue of their participation in REAs should not be regarded

[444] The Monopolies and Mergers Commission, *op.cit.*
[445] Rose, J., *op.cit.*
[446] *ibid.*, p. 75.
[447] *ibid.*, p. 75.

as a barrier to entry. Furthermore, Rose argued that it was not normally expected of incumbents that they assist their competitors in the market place through the supply of essential inputs.

Because non-refiners are able to source product from up to four refiners in Australia and play them off against each other, Rose reasoned that non-refiners could still share in the benefits of REAs indirectly through entering a supply agreement with any one of the four refiners.

Rose considered the overall attitude of the ACCC on REAs in its 1996 Report to be contradictory, on the one hand arguing that they were anti-competitive, and yet on the other hand maintaining that it would be pro-competitive if the non-refiners were also allowed to participate.

Rather than being totally dependent on the local refiners in a particular geographic market, Rose makes a valid point that REAs potentially create many more suppliers of product than might otherwise be the case, provided refiners have surplus product available over and above the requirements of their retail network.

The debate in the literature has primarily focused on whether REAs have any exclusionary effects. Implicit in this debate would appear to be the reasoning that any exclusionary effects are in fact anti-competitive. Even if REAs are exclusionary in their impact, it does not necessarily follow that this would lead to an anti-competitive detriment. As Posner has observed, the primary focus of antimonopoly policy should be on the maintenance of

competitive pricing, and not on particular numbers of competitors.[448] Any exclusionary effects of REAs are only likely to result in an anti-competitive detriment in two situations. The first is that the exclusion of non-refiners results in the removal of more efficient participants from wholesale and retail markets, thus potentially leading to a reduction in both allocative and productive efficiency. The second is if the exclusion of non-refiners from the wholesale and retail markets results in the remaining wholesale and retail market participants adopting more co-operative stratagems against each other rather than engaging in vigorous competition, thus leading to a reduction in allocative efficiency. If neither of these two conditions are satisfied, then it is unlikely that any exclusionary effects arising from REAs are going to result in an anti-competitive detriment.

In relation to concerns that non-refiners are refused entry into REAs, Williamson's hostage model provides a legitimate basis as to why non-refiners should be refused entry in that they cannot provide sufficient security to a refiner to mitigate against the prospect and threat of post-contractual opportunistic behaviour. It appears even the ACCC was aware of the fact that non-refiners could not fully reciprocate on the kind of services provided by the oil majors within the framework of a refinery exchange agreement, but perhaps did not fully appreciate the significance of this in regard to minimising transaction costs.[449]

It is certainly possible that REAs could act in such a way as to limit or even exclude altogether non-refiners from participation in wholesale and retail

[448] Posner, R. A., *op.cit.*, p. 531.
[449] Fels, A., Competition Not Regulation is in Consumers' Best Interests, p. 19.

markets. Whether this scenario is likely to occur will depend on the willingness of refiners to make product available at fair and reasonable prices, as well as the degree to which a particular geographic market is contestable to imported sources of product accessible to non-refining wholesalers. If a geographic market is readily accessible to imported product for non-refining wholesalers, then concerns regarding the exclusionary effects of REAs would appear to be eased.

5.7 Conclusions

The fundamental flaw in the traditional arguments used to justify REAs in that they enable more refiners to participate in markets and they prevent the wasteful cross-hauling of product is that such benefits could also be delivered through unilateral trading arrangements as well. Possible transaction cost savings provide a reason as to why the bilateral trading arrangement provided through a refinery exchange agreement may be preferred to a unilateral trading arrangement. Through his hostage model, Williamson explains the existence of REAs on the basis of mitigating against post-contractual opportunistic behaviour which provides a powerful pro-competitive and efficiency enhancing rationale.

On the other hand, those who maintain that REAs are anti-competitive have relied on three principal arguments. Possibly the weakest is that REAs facilitate the exchange of information flows between market rivals which could lead to collusion and anti-competitive conduct. This argument is weak because such objections could also be raised in regard to unilateral trading arrangements, as in the case of the buy-sell arrangements that eventually replaced the refinery exchange agreement system in Australia.

The objections raised to REAs on the basis of possible exclusionary effects and market sharing effects appear to be more substantive. Both of these objections are heavily dependent on the extent to which a particular geographic market is closed off and impervious to imports. If a geographic market is reasonably accessible to imports for both refiners and non-refiners alike, then any objections raised in relation to REAs would be difficult to sustain.

The objection based on possible exclusionary effects assumes that any limitation or exclusion placed on non-refiners from participating in wholesale and retail markets will have an anti-competitive effect. This may not necessarily be the case.

Arguable the strongest objection raised in relation to REAs is in their ability to allow a refiner to constrain the amount of product available to rival refiners, and thereby condition them against engaging in competitive conduct in order to achieve an overt or tacit market sharing collusive arrangement. Even Williamson recognised that REAs could be used for market division purposes under certain conditions, and Ayres has suggested that Williamson's hostage model could be used as the means through which to enforce discipline amongst a collusive oligopoly.

Careful scrutiny of the literature would suggest that REAs are unlikely to be anti-competitive on a wholesale basis. Rather, that REAs could have anti-competitive effects in highly selective circumstances, particularly where a geographic market is relatively inaccessible to imports.

Although views on the likely impact of REAs largely fall into two distinct groups, even amongst some of those who conclude, on balance, that they are pro-competitive, there is an acknowledgement that the potential exists for REAs to serve an anti-competitive purpose as well. This suggests there is an issue worth investigating in relation to REAs.

An obvious gap in the literature is that most of the conclusions drawn in relation to REAs have been based on conjecture and supposition. The closest to an empirical study would be the report by the Hawaii Attorney General. However, to date, no conclusions have been drawn on the basis of empirical observation that compares a market with and without REAs in place. The purpose of this current study is to address this deficiency to arrive at a better informed conclusion on the overall competitive impact of REAs in Australia. The empirical testing of the competitive effects of REAs will be taken up in Chapter 6.

Chapter 6: Statistical Analysis and Modelling of REAs

6.1. Introduction

The purpose of this Chapter is to test the competitive effects of REAs through measuring their impact on petrol prices. As was discussed in Chapter 2, since petrol is homogeneous product it is likely that price is the main basis upon which competition occurs within the Australian downstream petroleum industry.

To undertake a direct analysis of any price effect associated with the termination of REAs would require comparison of a refiner's own delivered petrol price to the oil terminal (as REAs allowed the oil majors to be supplied at their own cost of production) to the delivered product price negotiated under buy-sell arrangements. However, the oil majors are most unlikely to be willing to provide this data. Mobil has expressed reticence to discuss how it sets it wholesale prices in a public setting because "this is commercial confidential information".[450] Similarly, Delpachitra and Beal have observed:

> Australian [wholesale price] data are not publicly available owing to high commercial sensitivity.[451]

This leaves the search for another indicator that could provide the basis for comparison between petrol prices before and after the termination of REAs. Another possibility is the so-called terminal gate price (TGP) which is

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[450] *Australian Competition and Consumer Commission* (2007) Transcript of Proceedings at Melbourne on Wednesday, 19 September 2007, at 1pm. Petrol Price Inquiry Hearing, p. 84.
[451] Delpachitra, S. and Beal, D. (2002) Petrol Prices Disparity: Did the Removal of Price Surveillance Create Price Competition? *Economic Papers* 21, 56-65, p. 60.

published by all of the oil majors as well as other major wholesalers. A potential difficulty with the TGP is that it may not necessarily be a price at which transactions occur within wholesale markets. According to the ACCC, the TGP is the spot price at the terminal gate for anyone turning up with a truck provided petrol is available and they can meet the necessary conditions.[452] In relation to the TGP, the ACCC has observed that:

> While the oil companies publish their terminal gate prices daily on the internet, it is not clear how many sales are made at the published terminal gate price.[453]

Consumer Affairs Victoria (CAV) has opined that because TGPs "are not necessarily the prices at which actual transactions occurred, they must be treated as notional prices only".[454]

Comments by some of the oil majors also lend support to the proposition that not too many sales of petrol at the wholesale level occur at the TGP. Australia's largest refiner in Caltex has commented that it makes very few sales at the TGP.[455] Similarly, BP has commented that it provides discounts off the TGP to all of its wholesale customers under contract, and that it has made no sales of fuel in recent years on a spot basis.[456] In other words, it appears that BP has made no sales of petrol at the TGP in recent years.

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[452] Australian Competition and Consumer Commission (2006) *Senate Economics Legislation Committee Inquiry into the price of petrol in Australia.* Canberra, p. 37.
[453] *ibid.*, p. 36.
[454] Consumer Affairs Victoria, *op.cit.*, p. 43.
[455] Caltex Australia Limited (2007) *Caltex submission to the ACCC inquiry into the price of unleaded petrol.* Sydney, p. 38.
[456] BP Australia Pty Ltd (2007) *Submission by BP Australia Pty Ltd to the ACCC inquiry into the price of unleaded petrol.* Melbourne, p. 22.

This probably leaves the retail price as the only other possible price measure through which to undertake an analysis of REAs. As was concluded in Chapter 3, it is arguably the case that retail petrol prices will closely follow and reflect changes in wholesale prices because of the motivation on the part of the oil majors to avoid problems associated with double marginalisation and do this through pushing the retail petrol price down to marginal cost. The major advantage of using the retail price is that it is a price at which transactions actually occur and is readily observable. Unlike wholesale prices, retail prices are publicly available information. This Chapter will therefore test for the competitive effects of REAs through the price of regular unleaded petrol sold through retail service station outlets to motoring consumers in capital cities. It is proposed to use changes in the average level of the notional industry margin (NIM) as a proxy for the level of competition. Details on the construction of the NIM are described below in section 6.3.

An alternative indicator that could serve as a proxy for the level of competition is the variance in the level of the NIM. However, as no hypothesis will be put forward as to how the variance of the NIM relates to competition, this issue will not be considered further.

As price is likely to be the primary basis upon which competition occurs in the downstream petroleum industry and capital city retail petrol prices are likely to closely follow and reflect changes in wholesale prices, testing for the competitive effects of REAs through their impact on retail petrol prices

(assuming that all other things are equal) would appear to be a sound basis on which to proceed.

6.2. Hypothesis Testing

The change that is being tested for is the price effect, if any, on capital city retail petrol markets which arises from the termination of REAs. This will be tested through determining the effect, if any, from the termination of REAs on the average level of the NIM. If the termination of REAs has no statistically significant effect on the NIM then there will be no change between the mean of the NIM before termination, BEFORE, as compared to the mean of the NIM after termination, AFTER. The proposition that the termination of REAs has no effect on the mean of the NIM forms the basis of the null hypothesis. So the specification of the null hypothesis for the mean of the NIM is that:

H_0: BEFORE = AFTER

On the other hand, if the termination of REAs does have an effect on the average level of NIM then it would be expected that the mean of the NIM before termination, BEFORE, will be statistically significantly different from the mean of the NIM after termination, AFTER. The proposition that the termination of REAs has an effect on the average level of the NIM forms the basis of the alternative hypothesis.

The alternative hypothesis is a two-sided test as there could be different effects arising from the termination of REAs. If REAs were likely to be pro-competitive then the mean of the NIM before termination, BEFORE, will be statistically significantly lower than the mean of the NIM after termination,

AFTER. Alternatively, if REAs were likely to be anti-competitive then the mean of the NIM before termination, BEFORE, will be statistically significantly higher from the mean of the NIM after termination, AFTER. So the specification of the alternative hypotheses for the mean of the NIM are:

H_1: BEFORE < AFTER

H_2: BEFORE > AFTER

The starting date for this study is 30 June 1997. This is to ensure that there is a sufficient amount of time elapsing before the termination of REAs in all of the cities being tested.

In order to test for the effect arising from the termination of REAs, there are potentially five capital cities in Australia that could be examined. There were refineries in Sydney, Melbourne, Brisbane, Adelaide and Perth that all exchanged product under REAs until those agreements were terminated.

It was decided to test for the impact associated with the termination of REAs on those capital cities unaffected by restrictive fuel specifications. Where the introduction of new fuel specifications preceded the termination of REAs, it was decided not to test for the impact as this may have already distorted the operation of wholesale petrol markets in those affected capital cities. Therefore, it was decided to omit both Brisbane and Perth from this study because of legislated fuel specifications enacted in Queensland and Western Australia. Details of the fuel specifications operating throughout Australia during the period of this study were provided in Chapter 2.

From 1 January 2000, REAs in respect of the Mobil Port Stanvac refinery located near Adelaide were terminated. Hence, the structural change being tested for in relation to Adelaide occurred from the beginning of 2000. Prior to 2000, Mobil had entered into REAs with each of the other three domestic refiners in regard to the Port Stanvac refinery. It was decided to terminate the study in Adelaide to coincide with the introduction of the new fuel specifications by the South Australian Government in March 2001.

The termination of REAs in Sydney and Melbourne was prompted by the decision of BP to inform the three other domestic refiners that it was withdrawing from the existing REAs from 1 July 2002. Hence, the structural change being tested for in relation to both Sydney and Melbourne occurred as from 1 July 2002.

The natural finishing point for this study for Sydney and Melbourne is the introduction of a new national fuel specification that came into effect from the beginning of 2004 limiting the amount of MTBE and olefins in petrol (although data was only available up until the end of August 2003).

6.3. The Data

Based on the conclusions reached in Chapter 3, changes in wholesale petrol prices should be fully reflected through changes in retail petrol prices in that petrol is arguably retailed at marginal cost. This provides the opportunity to identify and measure the effects of potential structural changes in wholesale petrol markets, such as that arising from the termination of REAs, through their impact on retail petrol prices, *ceteris paribus* (all other things being equal).

However, a potential difficulty in trying to isolate and measure the competitive impact of REAs through retail petrol prices is that the *ceteris paribus* assumption is often violated in that retail petrol prices are subject to several other influences aside from potential structural changes affecting Australian wholesale petrol markets. These other influences include the international price of crude oil, which is the major input in the production of petrol, as well as international refining margins, the difference between the price of refined petroleum products and crude oil. In order to extricate these other influences from the retail petrol price so that the impact arising from REAs can be identified, isolated and quantified as much as possible, a proxy for wholesale petrol prices that is unaffected by developments in Australian wholesale petrol markets needs to be subtracted from the retail price. Hence, the NIM has been constructed by subtracting an independently determined proxy for the wholesale unleaded petrol price from the retail unleaded petrol price. This approach ensures that the influence of other factors such as the international price of crude oil and refining margins are removed entirely and that the NIM will estimate the total notional margin accruing to petrol suppliers at various stages in the supply chain. Thus assuming that petrol at the retail level is sold at marginal cost, the level of the NIM should reflect developments and changes in capital city wholesale market conditions and provide an indication of the returns accruing to the oil majors.

The NIM data is reported in Appendix 2.

Weekly average retail unleaded petrol price data was obtained from market research company *Informed Sources*.[457]

The independently determined proxy used for the wholesale unleaded petrol price was the IPI calculated by the ACCC. The IPI was used to regulate wholesale petrol prices until the end of July 1998 and the ACCC has continued to calculate the IPI since that time. Details on the construction of the IPI were provided in Chapter 2.

The IPI data was provided to the researcher by the ACCC.[458]

The ACCC has commented that there are two points to bear in mind in relation to the IPI.[459] The first is that the IPI is a wholesale price indicator and not a retail price indicator. The second is the methodology for determining the IPI has not been reviewed for some time which in turn leads to two possible shortcomings: first, the IPI may not reflect the actual product specifications used in Australia; and second, it may not reflect efficiencies that have occurred in the Australian downstream petroleum industry. Despite these potential shortcomings, the ACCC has maintained that the IPI "remains a useful benchmark to assess price movements over time".[460]

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[457] Informed Sources collects their data from all the oil majors who transmit their pricing to them either every fifteen minutes, hourly or whenever changes occur. Informed Sources also obtains this information from electronic card swipes at the service station console. For non major players, Informed Sources collect prices manually, through surveying independent retail service station sites. This occurs twice a day in Sydney, Melbourne, and Adelaide.

[458] The IPI was provided to the researcher by the ACCC on a confidential basis, although market research companies Economic & Energy Analysis Pty Ltd and FUELtrac produce similar price series to the IPI that are available on a commercial basis.

[459] Australian Competition and Consumer Commission, *Terminal gate pricing arrangements in Australia and other fuel pricing arrangements in Western Australia*, p. 27.

[460] *ibid.*, pp. 27-28.

Concerns expressed by the ACCC that the product specification it uses for the calculation of the IPI may not reflect the actual product specifications used in Australia would appear to be overly cautious. This is because the oil majors would all appear to agree that the MOPS 95 RON benchmark used by the ACCC for the calculation of the IPI is the appropriate "benchmark quote for all commercial traded Australian grade unleaded product".[461]

The second concern noted by the ACCC in regard to the calculation of the IPI would appear to relate primarily to the determined *local component* of the IPI. In this study an adjustment was made to the IPI to remove the local component for two reasons: the first was because of the reservations noted by the ACCC that the IPI may not reflect efficiencies that have occurred in the Australian downstream petroleum industry; the second was because more often than not, the NIM calculated from an IPI including the local component provided a NIM that was negative. Persistent ongoing negative NIMs are a perverse result as firms cannot continue in business indefinitely if they cannot cover their costs of supply and of doing business. This result suggests that the local component of the IPI, that has been set at 7.1 cpl, had previously been set too high as it appears that competition in capital city wholesale markets, flowing into retail petrol prices, had been persistently eating into this local component. Furthermore, there was little or no additional room for any retailing margin on top of the local component. This view is consistent with McKenzie (Shell) who opined in relation to the IPI

[461] Fox, K. MOPS 95 – The Benchmark for Australian Grade Unleaded Motor Spirit. http://www.aip.com.au/industry/benchmark.htm. [Accessed 15 November 2005]

when it was used to regulate wholesale petrol prices that "in the vast majority of cases you weren't able to achieve 7.1 cents in the market".[462]

Rather than have a data series consisting largely of negative NIMs, it was considered preferable to remove the local component from the IPI altogether. Removal of the local component does not change the relativities between the NIM results and arguably ensures that the adjusted IPI is closer to a genuine wholesale price benchmark. This adjustment was made by subtracting 7.1 cpl from the IPI after an adjustment had been made to remove the impact of the GST from both the IPI and the retail price (which is described below in section 6.3.1).

The use of the IPI methodology as an appropriate benchmark for wholesale petrol prices in Australia would appear to be uncontroversial as it is a position supported by the ACCC as well as all of the oil majors.[463] The argument as to why the IPI methodology is an appropriate benchmark for wholesale petrol prices in Australia is that petrol is an internationally traded commodity and Australian refineries compete on a regional basis, particularly in relation to Singapore, the major refining centre in the Asia-Pacific region. According to Caltex:

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[462] *Productivity Commission, op.cit.*, p. 47.

[463] See: Australian Competition and Consumer Commission (2005) *Understanding petrol prices in Australia: Answers to some frequently asked questions.* Canberra; Caltex Oil Australia Pty Ltd (2005) Petrol pricing – the plain facts June 2005. http://www.caltex.com.au/pricing_pla.asp [Accessed 1 July 2005]; BP Australia Ltd (2005) Retail Pricing May 12 2005. http://www.bp.com.au/conveniences_stores/pricing.asp [Accessed 1 July 2005]; The Shell Company of Australia Limited (2005) What Drives Prices? http://www.shell.com.au/home /PrintFramework?siteId=au-en&FC3=/home/au-en/html/iwg [Accessed 1 July 2005]; ExxonMobil Australia Pty Ltd. Facts on Petrol Pricing. http://www.exxonmobil.com.au/mobil /mn_mobil_products_automotive_facts.asp [Accessed 13 February 2006]

> Prices for petrol from Australian refineries are not based on the actual cost of imported petrol or the crude oil that is refined into petrol. Instead, the ex-refinery price of petrol is based on an "import parity price" calculation. This is a theoretical calculation based on the Singapore market price for petrol, adjusted for Australian fuel standards and freight to Australia. The import parity price is not regulation but instead determined by market forces.
>
> The reason why Australian petrol prices follow Singapore market prices is that Australian refineries must compete against petrol imports ... and Singapore is a major source of petrol for importers.[464]

The NIM as calculated here has also been described as an importer margin as it represents the difference between the retail price paid by consumers and the cost of importing the product.[465]

6.3.1 Adjustments for Taxation and Subsidy Arrangements

There were various Commonwealth and state government taxes as well as state government rebates applying to the price of petrol over the period under examination in the three cities. In order to ensure the calculation of the NIM was not impacted, and thus distorted, by taxation and rebate arrangements, the following adjustments were performed in relation to tax and rebate arrangements.

Details of business franchise fees and subsidies provided by state governments have been provided in Chapter 2. In order to account for the period in which business franchise fees on petrol applied, the relevant

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[464] Caltex Oil (Australia) Pty Ltd, Petrol pricing – the plain facts June 2005. http://www.caltex.com.au/pricing_pla.asp [Accessed 1 July 2005]

[465] Delpachitra, S. B. (2002) Price rigidity in the downstream petroleum industry in New Zealand: where does it happen? *Energy Economics* 24, 597-613, pp. 601-604.

amount of the variable rate of the business franchise fee on petrol applying in respect of Sydney, Melbourne and Adelaide has been added to the IPI (as the IPI was provided exclusive of the application of business franchise fees). In order to account for the interim subsidy that applied on the sale of petrol in Sydney in the calculation of the NIM, 0.22 cpl has been subtracted from the IPI between August and November 1997. In order to account for the subsidy that applied on the sale of petrol in Melbourne, 0.43 cpl has been subtracted from the IPI in Melbourne from August 1997 onwards, which was increased to 0.473 from July 2000 to account for the imposition of the GST.[466]

Details on petrol excise have previously been provided in Chapter 2. Because petrol excise is applied on the basis of a fixed amount, the amount of excise applying to both the IPI and the retail petrol price is always going to be exactly the same amount. As a consequence, the impact of petrol excise is entirely removed when subtracting the IPI from the retail petrol price during the calculation of the NIM. Thus, there is no need to make any allowance for petrol excise in the calculation of the NIM.

An adjustment was made to the IPI to remove the impact arising from the application of the GST when calculating the NIM. This was in order to remove any difference between the amount of the GST applying to the IPI as compared to the retail price. Because the GST is applied to each transaction in a supply chain on an *ad valorem* basis, any difference between the IPI and the retail price will result in a discrepancy in the

[466] The payment of the 0.43 cpl subsidy in Melbourne would have reduced wholesale petrol prices by 0.473 cpl after the imposition of the GST as the GST is an *ad valorem* tax charged at the rate of 10 per cent.

amount of GST applied to the IPI as compared to the retail price. Because the amount of GST applying to the IPI and the retail price could differ, the level of the NIM could either increase or decrease directly as a result of the imposition of the GST, thus leading to a distortion in the calculation of the NIM.

In order to adjust for this potential distortion, the approach adopted was to equalise the amount of GST applying to the IPI to the amount of GST applying to the retail price. This was undertaken by removing the amount of GST initially applied to the IPI by calculating one eleventh of the IPI and then subtracting that amount from the IPI to arrive at an IPI free from the application of the GST. The amount of GST applying to the retail price was then calculated by multiplying the retail price by one eleventh, and then adding this amount to the IPI free of GST. This adjustment ensures that in the calculation of the NIM any impact arising from the imposition of the GST is entirely removed.

6.4. Graphical Representations

The NIM has been graphed for all three cities and is provided below in Charts 4, 5, and 6 with the arrow representing the point of change between BEFORE and AFTER in relation to the termination of REAs.

Chart 4: Notional Industry Margin for Adelaide (in cpl)

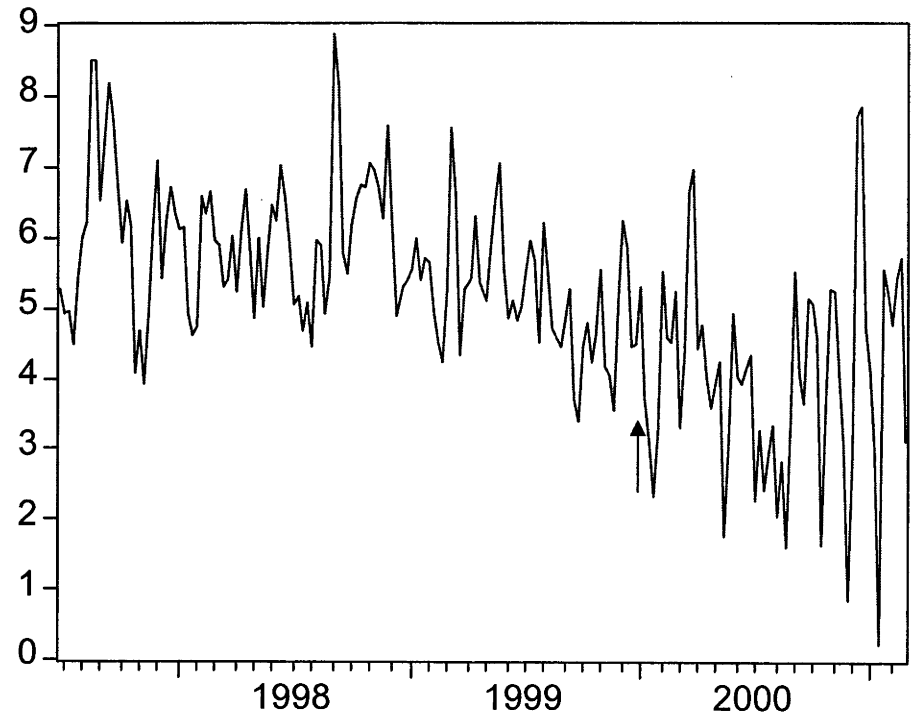


Chart 5: Notional Industry Margin for Melbourne (in cpl)

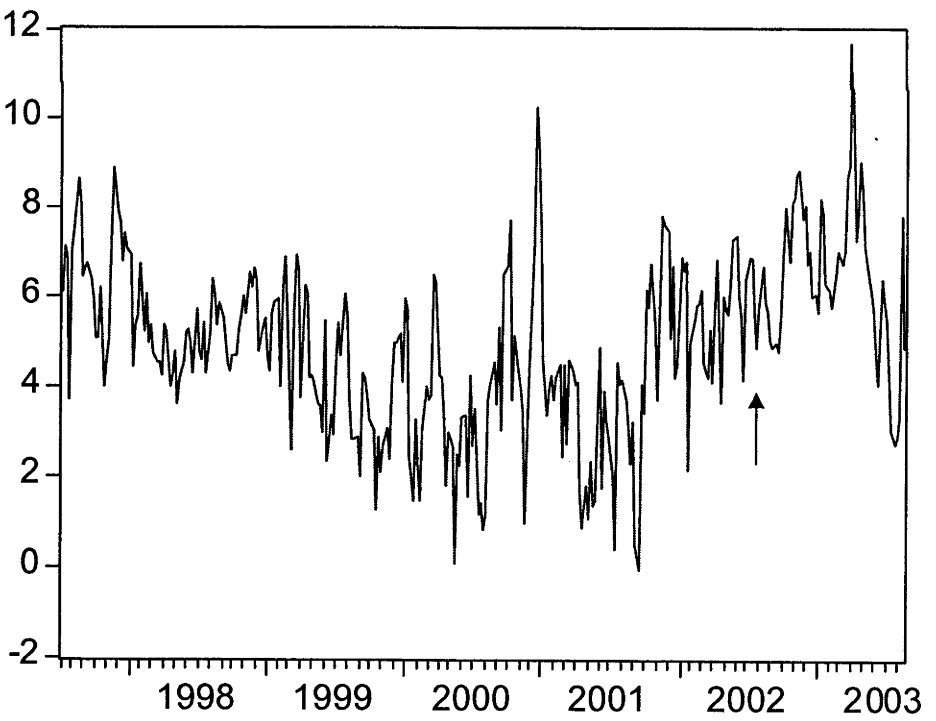
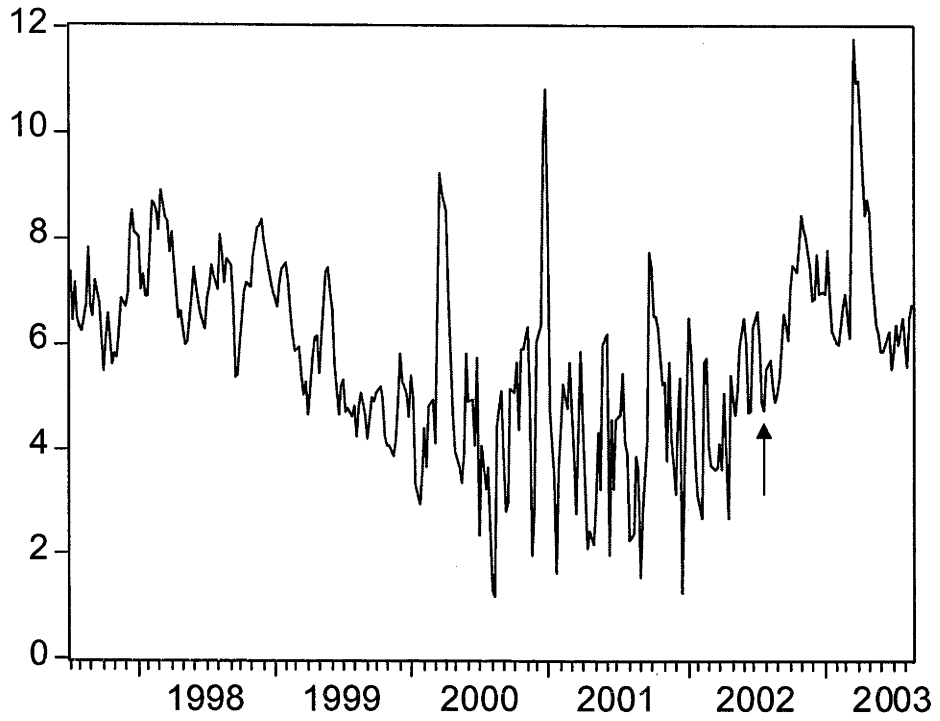


Chart 6: Notional Industry Margin for Sydney (in cpl)



In trend terms, it would appear the NIM in Adelaide is fairly flat until the end of 1998 and then it begins trending downwards.

In trend terms in both Melbourne and Sydney, it would appear the NIM is heading down until mid-2000, when it then appears to begin heading upwards.

The NIM in all three cities oscillates through time. This result is unremarkable given that most economic variables, such as commodity prices, oscillate with an irregular period and amplitude. Some of this oscillation could be due to differences in the length of time it takes for changes in Singapore international benchmark prices to flow through into Australian retail petrol prices. The IPI is based on a 7-day rolling average of Singapore international benchmark spot prices. According to the ACCC, there is usually a lag of between seven to ten days between movements in

the Singapore international benchmark spot price and Australian retail petrol prices.[467] On the other hand, the AIP contends that it can take between one and two weeks before changes in Singapore international benchmark spot prices show up in Australian wholesale petrol prices.[468]

In Adelaide, the NIM began initially at a relatively low level at around 5 cpl for a period of around four weeks before gradually moving up and spiking at 8.5 cpl after seven weeks. This initial relatively low level for the NIM may be related to the influence exerted by the entrance of independent wholesaler and retailer Liberty into the Adelaide retail market at this time and reflect the attempt by Liberty to capture market share, with the gradual rise and spike indicating that possibly Liberty's attempt to capture a greater retail market share had come to an end. Newspaper reports suggest that Liberty undercut its competition in the retail market by 5 cpl, and promised at the end of June to be "very competitive over the next four or five weeks" with the objective of being "the cheapest in the metropolitan area of Adelaide".[469] During the period of price regulation up until the end of July 1998, the NIM in Adelaide is fairly stable at an average of around 5.9 cpl.

The NIM in Adelaide rises slightly on average during the first period of price deregulation from the beginning of August 1998 up until the end of 1998 to around 6.3 cpl, with a spike occurring in early to mid-September as the NIM peaked at 8.9 cpl. This spike may be related to a fire that occurred at the Port Stanvac refinery on 2 August 1998 which was responsible for

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[467] Australian Competition and Consumer Commission (2007) Petrol Pricing. *Media Release*, 24 January.
[468] Australian Institute of Petroleum (2006) *Submission to the Inquiry into the Price of Petrol in Australia*. Canberra, p. 16.
[469] *The Advertiser* (1997) Newcomer may ignite petrol price war. 1 July.

closing down the refinery for two months. According to the Department of Primary Industries and Resources South Australia, petrol stocks remained tight for a period of two months following the fire at the Port Stanvac refinery.[470]

In Melbourne, the last six months of 1997 are characterised as a period of a relatively high NIM, at around 6.6 cpl on average, as compared to the first seven months of 1998 when the NIM was generally lower, at around 5.0 cpl on average. The relatively high level for the NIM during the second half of 1997 may be related to less vigorous price discounting behaviour observed in the retail market during this period. A spokesperson for the RACV accused Melbourne petrol retailers of ceasing to discount petrol in late November 1997:

> Somebody has decided that enough is enough – and it seems that they have all agreed to end discounting for a while.[471]

Following deregulation, the NIM in Melbourne rises on average to 5.5 cpl for the period up until the end of 1998.

In Sydney, the NIM over the period of price regulation up until the end of July 1998 appears to be fairly indistinguishable from the initial period following deregulation lasting up until the end of 1998, with the NIM averaging around 7.1 cpl.

The initial experience of price deregulation prompted the ACCC to observe in early 1999 with regard to the entire country, that in the aftermath of

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[470] Primary Industries and Resources South Australia (1999) *PIRSA Annual Report 1998-99*. Adelaide, p. 41.
[471] *Herald Sun* (1997) Dollar Blamed for Petrol Price Rise. 29 November: 5.

deregulation, retail prices had gone up, in relative terms, partly in response to increased retail margins.[472]

During the first six months of 1999, the NIM in all three cities fell on average before stabilising at a lower level for the remainder of 1999. In the first half of 1999 the average NIM in Adelaide was 5.5 cpl, before falling to 4.9 cpl in the second half of 1999. In Melbourne, the average NIM was 4.9 cpl in the first half of 1999, and fell to 3.7 cpl during the second half of 1999. In Sydney, the average NIM was 6.2 cpl in the first half of 1999, and fell to 4.7 cpl during the second half of 1999. The pattern in the NIM may reflect some kind of gradual adjustment process resulting from the removal of wholesale price regulation, or some other structural change that started to impact across all three cities during the first six months of 1999.

The NIM in Adelaide then fell again during the period after which REAs were terminated for the Port Stanvac refinery from the beginning of 2000 until the end of February 2001, with the NIM averaging around 4.0 cpl over this period. There are two observable spikes in the NIM in Adelaide during the post-refinery exchange agreement period. The first spike occurred during the final weeks of March 2000 coinciding with media reports of discussions between Shell and Caltex regarding plans to merge their refineries into a joint venture company.[473] The second spike occurred during the middle weeks of December 2000 coinciding with a period of unexpected refinery shutdowns on the Australian eastern seaboard.

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[472] *Australian Service Station & Convenience Store News* (1999) Deregulation Conference – Key players air their differences. March/April: 16-19.
[473] *The Australian* (2000) Shell, Caltex weigh refinery merger. 15 March: 25.

From the period of mid-1999 until the end of July 2001, the level of the NIM in Melbourne is generally fairly stable, with the NIM averaging around 3.6 cpl over this period, although there are three discernable spikes in the NIM during 2000. The first spike occurred during the final weeks of March 2000 coinciding with media reports of discussions between Shell and Caltex regarding plans to merge their refineries into a joint venture company. The second spike occurred during and in the aftermath of a blockade of Melbourne fuel terminal facilities at the end of September 2000. The third spike occurred over the Christmas 2000 and New Year holiday period coinciding with a period of unexpected refinery shutdowns on the Australian eastern seaboard.

The NIM in Melbourne then rises to 5.1 cpl on average during the period coinciding with the implementation of terminal gate pricing legislation in Victoria in August 2001. The NIM then rises further, to 6.5 cpl on average, from the beginning of July 2002 coinciding with the termination of REAs. There is also a noticeable spike in the NIM during the midst of the Iraq war in early April 2003. There is also a noticeable trough in the NIM during the period of July and early August 2003, coinciding with the roll-out of the commercial alliance between Coles and Shell.

From the period of mid-1999 until the end of June 2002, the level of the NIM in Sydney is generally fairly stable, averaging about 4.6 cpl over this period, although there are two noticeable spikes in the NIM over this period. There is a spike in the NIM during mid-March 2000. This spike coincides with media reports of discussions between Shell and Caltex regarding plans

to merge their refineries into a joint venture company. There is another spike in the NIM over the Christmas 2000 and New Year holiday period coinciding with a period of unexpected refinery shutdowns on the Australian eastern seaboard. From July 2002, the level of the NIM rises coinciding with the termination of REAs, with the NIM rising to 6.9 cpl on average. There is also a spike in the NIM from mid-March 2003 until mid-April 2003 coinciding with the period of the Iraq war.

6.5. Exploratory Data Analysis

6.5.1 Descriptive Statistics

The descriptive statistics for BEFORE and AFTER for Adelaide, Melbourne and Sydney are provided in table 10 below.

Table 10: Descriptive Statistics for BEFORE and AFTER for Adelaide, Melbourne and Sydney

Statistic	Adelaide BEFORE	Adelaide AFTER	Melbourne BEFORE	Melbourne AFTER	Sydney BEFORE	Sydney AFTER
Mean	5.683	4.030	4.635	6.453	5.521	6.870
Median	5.567	4.024	4.559	6.394	5.463	6.490
Skewness	0.522	0.095	-0.077	0.122	-0.060	1.385
Kurtosis	3.391	3.424	2.952	3.695	2.669	5.245
Jarque -Bera	6.778	0.548	0.286	1.378	1.347	32.296

In regard to Adelaide for the BEFORE period, the distribution of the NIM was positively skewed and leptokurtic. The mean and the median were relatively close together, suggesting that the mean provides a reasonably good indication of the central tendency for the distribution of the NIM. However, the Jarque-Bera[474] statistic indicates that the null hypothesis of the NIM distribution being normally distributed should be rejected at the 5 per cent level of statistical significance, although it would be accepted at the 1

[474] The Jarque-Bera is a test statistic for testing whether a series is normally distributed. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic follows a chi-squared distribution with two degrees of freedom.

per cent level of significance. For the AFTER period, the distribution of the NIM is marginally positively skewed and slightly leptokurtic, while the Jarque-Bera statistic raises no concerns that the NIM is not normally distributed. Furthermore, the mean and the median are extremely close together, suggesting that the mean provides a reasonably good measure of the central tendency for the distribution of the NIM.

In regard to Melbourne for the BEFORE period, the NIM is marginally negatively skewed while both the kurtosis and the Jarque-Bera statistic indicate that the distribution of the NIM is close to normal. The mean and the median are also reasonably close to each other, suggesting that the mean provides a reasonable indication of the central tendency for the distribution of the NIM. For the AFTER period, the distribution is slightly positively skewed and leptokurtic, while the Jarque-Bera statistic raises no concerns that the NIM is not normally distributed. The mean and the median are also reasonably close to each other, suggesting that the mean provides a reasonable indication of the central tendency for the distribution of the NIM.

In regard to Sydney for the BEFORE period, the distribution of the NIM is marginally negatively skewed and reasonably platykurtic, while the Jarque-Bera statistic raises no concerns that the NIM is not normally distributed. The mean and the median are very close together suggesting that the mean provides a reasonably good indication of the central tendency for the distribution of the NIM. For the AFTER period, the distribution of the NIM is positively skewed and strongly leptokurtic, while the Jarque-Bera statistic suggests that the NIM is not normally distributed. The mean and the median

are only moderately aligned, suggesting that the mean only provides a rough approximation of the central tendency of the NIM. The outliers in the AFTER period all coincide with the period of the 2003 Iraq war.

6.5.2 Simple Hypothesis Test

At face value, it would appear that the mean of BEFORE is different to the mean of AFTER in all three cities under examination, although the mean of BEFORE in Melbourne and Sydney is lower than the mean of AFTER, whereas the mean of AFTER is lower in Adelaide than the mean of BEFORE. For Adelaide, the mean of AFTER is almost 1.7 cpl lower than the mean of BEFORE, whereas for Melbourne the mean of AFTER is 1.8 cpl higher and for Sydney is 1.3 cpl higher than compared to the mean of BEFORE.

The next step was to determine whether the changes recorded in the mean of the NIM between BEFORE and AFTER were statistically significant. It was decided to test for this using Student's t-distribution. The critical values and the t-statistics for all three cities are reported in table 11 below.

Table 11: t-Tests for the Mean of BEFORE and AFTER in Adelaide, Melbourne and Sydney

Statistic	Critical values of $t_{0.05}$	t-statistic	Probability ($T \leq$ t-statistic)
Adelaide (assuming equal variances)	±1.973	8.836	6.464×10^{-16}
Adelaide (assuming unequal variances)	±1.313	7.778	6.564×10^{-11}
Melbourne (assuming equal variances)	±1.967	-7.183	4.805×10^{-12}
Melbourne (assuming unequal variances)	±1.985	-7.558	1.932×10^{-11}
Sydney (assuming equal variances)	±1.967	-5.532	6.581×10^{-8}
Sydney (assuming unequal variances)	±1.985	-6.280	7.434×10^{-9}

The t-statistic for all three cities under examination is statistically significant at considerably less than the 1 per cent level. It thus appears that the mean of BEFORE is statistically significantly different from the mean of AFTER in all three cities. Based on these results, the null hypothesis that the NIM of BEFORE is the same as the NIM of AFTER is rejected, and the alternative hypothesis of H_2 in relation to Adelaide, and the alternative hypothesis of H_1 in relation to Melbourne and Sydney is accepted.

6.5.3 Conclusions of Exploratory Data Analysis

While t-statistics provide support for the alternative hypothesis of H_2 in Adelaide and H_1 in Melbourne and Sydney that BEFORE is statistically significantly different from AFTER in all three cities under examination, these results should be treated with caution. While these results may reflect the impact on the average level of the NIM arising from the termination of REAs, these results could also reflect, as well as be distorted by, other periods of structural change. An attempt will be made to control for other

possible periods of structural change in the modelling of the NIM conducted in the next section.

6.6. Modelling

After completing the exploratory data analysis which suggested there could be a statistically significant difference in the level of the NIM means between BEFORE and AFTER, it was decided to build a regression model for the NIM in order to quantify the possible impact arising from the termination of REAs, as well as to test whether possibly any of the observed effect in relation to the termination of REAs could be attributable to other factors.

Another means through which to test whether there is a statistically significant structural break between BEFORE and AFTER is through a Chow test. However, given that there could be several periods of structural change that may have to be accounted for, it was decided that it was preferable to build a regression model instead.

To build a theoretical model for estimating the level of the NIM would require a reasonably complete knowledge and understanding of the NIM determination process. Given that the NIM is determined through the decisions and interactions of numerous wholesale and retail market participants, the information requirements arguably preclude one from attempting to build a theoretical model for estimation of the NIM.

In this case, resort must be made to an empirical model using the NIM time series. The Box-Jenkins autoregressive integrated moving average (ARIMA) methodology will be employed, which is a three-stage iterative

procedure based on identification, estimation and diagnostic checking for constructing the model of the NIM.[475] In the identification stage, data will be used and any information on how the series was generated to suggest a subclass of parsimonious models to be considered.[476] In the estimation stage, the tentatively considered model is fitted to data and parameters estimated.[477] In the diagnostic stage, the fitted model will be examined in relation to the data to reveal any shortcomings in order to achieve model improvement.[478] This three stage process is repeated until a suitable representation is found.

Integration within an ARIMA model refers to whether a time series data is stationary or not. Empirical work based on time series data assumes that the underlying time series is stationary.[479] Time series data is stationary if the process generating the data is in equilibrium around a constant value (the underlying mean) and that the variance around the mean remains constant over time.[480] However, any time series data that is not stationary is said to be nonstationary. Nonstationary time series data can often be turned into a stationary series by taking the first difference of a series as outlined below in the case of data series 'y':

$$\Delta y = y_t - y_{t-1}$$

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[475] See Box, G. E. P., Jenkins, G. M., and Reinsel, G. (1994) *Time Series Analysis: Forecasting and Control*. Third Edition, Prentice Hall, Englewood Cliffs, New Jersey.
[476] *ibid.*
[477] *ibid.*
[478] *ibid.*
[479] Gujarati, D. N. (1995) *Basic Econometrics*. Third Edition, McGraw-Hill, New York, p. 709.
[480] Makridakis, S., Wheelwright, S. C. and Hyndman, R. J. (1998) *Forecasting: Methods and Applications*. Third Edition, John Wiley & Sons Inc, Hoboken, p. 136.

Sometimes nonstationary time series data has to be differenced twice (ie taking the first difference of the first difference). If time series data has to be differenced once to turn it into a stationary series, then it is said that the series is integrated of order 1, denoted by I(1). Similarly, if time series data has to differenced twice in order to make it stationary, then it is said that the series is integrated of order 2, denoted by I(2). If time series data is stationary then it is said to be integrated of order zero, denoted by I(0). If an ARIMA model is integrated of order zero, then it is referred to as an autoregressive moving average (ARMA) model. Stationarity is generally tested for using a unit root test. Unit root tests are considered further in section 6.6.1.2 below.

Provided time series data is stationary then it can be modelled in a variety of ways. Autogression within an ARIMA model refers to whether time series data can be modelled as a function of its previous values. A first order autoregressive process or AR(1) for data time series 'y' is as follows:

$$y_t = \mu y_{t-1} + e_t$$

where the value of the autoregressive coefficient μ must lie between –1 and +1 (otherwise the series is nonstationary) and e_t is a random error term.

A moving average within an ARIMA model refers to whether time series data can be modelled as a function of past error terms. A dependence relationship between time series data and its previous error terms is known as a moving average. A first order moving average or MA(1) for data series 'y' is as follows:

$$y_t = \delta e_{t-1} + e_t$$

where the value of the coefficient on the lagged error term δ must lie between -1 and $+1$ (otherwise the series is nonstationary).

Once the identification stage for an ARIMA model has been completed, the model is estimated and then subject to diagnostic checking to verify that the model is appropriate. Diagnostic checking is performed through examination of the residuals to see if there is any pattern that is unaccounted for.

In testing for the impact of the termination of REAs on the NIM, the intervention analysis of Box and Tiao will be used.[481] According to Valadkhani and Layton, intervention analysis has been used by many analysts in a wide variety of applications.[482] Under intervention analysis, an indicator (or dummy) variable is included in the model which takes only the values of 0 and 1 to denote the non-occurrence and occurrence of the intervention as long as the timing of the intervention is known. Intervention analysis will be used to control for the termination of REAs as well as for other identified events impacting on the level of the NIM within the model.

It is intended to follow the general ARIMA process of the order (p, d, q) which is estimated as:

$$\emptyset_p(B)\Delta^d Z_t = \theta_0 + \theta_q(B)a_t + \beta D_t$$

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[481] Box, G. E. P. and Tiao, G. C. (1975) Intervention Analysis with Applications to Economic and Environmental Problems. *Journal of the American Statistical Association* 70 No. 349, 70-79.

[482] Valadkhani, A. and Layton, A. P. (2004) Quantifying the Effect of the GST on Inflation in Australia's Capital Cities: An Intervention Analysis. *The Australian Economic Review* 37, 125-138, p. 128.

where '$\emptyset_p(B)$' represents a 'p'-order polynomial lag operator; 'Δ^d' denotes an ordinary difference operator with 'd' the number of times the difference is applied; 'Z' is the NIM; 'θ_0' is a constant; '$\theta_q(B)$' denotes a 'q'-order polynomial lag operator; 'a' is a white noise process; 'p' is the number of autoregressive terms; 'q' is the number of moving average terms; 'D' represents the dummy variables with 'β' as their coefficients; and 't' the time period.

Whilst not providing a behavioural explanation for the time path of the NIM, the ARIMA model should capture any underlying systematic time series patterns in the data. It is important that such systematic time series patterns within the fluctuations in the data be accounted for so that the intervention arising from the termination of REAs can be accurately gauged.[483]

6.6.1 Identification

As part of the ARIMA modelling process, appropriate values for 'p', 'd', and 'q' need to be chosen. The identification of an ARIMA process is not an exact science, but the plotting of the autocorrelation function (ACF) and the partial autocorrelation function (PACF) can provide guidance.

Autocorrelation is a measure of the linear relationship between time series data, say Y_t, with previous lagged values of itself, for example Y_{t-1} and Y_{t-2}. The autocorrelations at various lags make up the ACF. A plot of the ACF is known as a correlogram.

[483] Eviews 6.0 was used in the estimation process.

Partial autocorrelation measures the degree of association within time series data between Y_t and Y_{t-k}, when the effects of other time lags – 1, 2, 3, … k–1 – are removed. The partial autocorrelations at various lags make up the PACF and is also plotted and known as a partial correlogram.

The ACF and PACF and the pattern of their associated correlograms provides an indication on what sort of autoregressive process and/or moving average process could be driving the time series data, or expressed another way, what the value of 'p' and 'q' could be.

6.6.1.1 Correlograms

The first step in the modelling process is to identify the appropriate form of the NIM that should be used for modelling purposes, as well as determining whether it follows an autoregressive process, a moving average process, or some combination thereof. This can be undertaken through the identification of the ACF and the PACF and the resulting correlogram and partial correlogram (all correlograms and partial correlograms are reported in Appendix 3).

In regard to Melbourne and Sydney, the correlogram begins at a reasonably high value (0.721 at lag 1 for Melbourne, and 0.810 at lag 1 for Sydney) and then decay in a more or less exponential manner. For Sydney, the ACF is still individually statistically significantly different from zero at up to 49 lags, while for Melbourne, the ACF is still individually statistically significantly different from zero at up to 28 lags. The pattern of the ACF for Melbourne and Sydney could be indicative of either a time series for the NIM that is nonstationary or which obeys a low order autoregressive

process. It is not possible to use the ACF to distinguish between a unit root process and a stationary process with an autoregressive coefficient close to unity. If the NIM time series for both Melbourne and Sydney are stationary, then the PACF dropping off after one lag is suggestive of a relatively straight-forward AR(1) process.

The correlogram for Adelaide, begins at a reasonable high value of about 0.635 at lag 1, and then decays to 0.348 at lag 2 where it meanders (through a mixture of exponential decay and damped sine waves) before gradually reducing towards zero. For Adelaide, the ACF is still individually statistically significantly different from zero at up to 35 lags. For Adelaide, the PACF drops off after one lag although it is still statistically significantly different from zero at lags 3, 5, 6, and 13. The long period of decay of the ACF may be indicative of a nonstationary time series or a low order autoregressive time series.

If the NIM time series for Adelaide is stationary, then the pattern of the ACF, which is characterised by a mixture of exponential decay and a damped sine wave, is possibly suggestive of an AR(2) process.[484] On the other hand, the PACF beginning to decay immediately after one lag is suggestive of an AR(1) process.

6.6.1.2 Unit Root Tests

The next stage of the identification process is to determine whether the NIM is stationary for Adelaide, Melbourne, and Sydney. To determine whether the NIM series in each city is stationary, a unit root test using the

[484] Box, G. E. P., Jenkins, G. M., and Reinsel, G., *op.cit.*, p. 187.

Augmented Dickey-Fuller (ADF) test[485] and the Phillips-Perron (PP) test was conducted.[486] For both the ADF test and the PP test, it needs to be determined whether to include an intercept, an intercept plus a linear trend term, or neither an intercept nor a linear trend term.

The ADF test and the PP test were performed using two specifications: the first with the inclusion of a constant term; and the second with a constant as well as a linear trend term. Table 12 below presents the results.

Table 12: Augmented Dickey-Fuller and Phillips-Perron Tests for NIM in Sydney, Melbourne and Adelaide

City	ADF test with constant	ADF test with constant and trend	PP test with constant	PP test with constant and trend
Sydney	-5.809*(0 lags)	-5.844*(0 lags)	-5.669*	-5.659*
Melbourne	-5.640*(1 lag)	-5.680*(1 lag)	-7.234*	-7.272*
Adelaide	-2.533#(5 lags)	-8.985*(1 lag)	-6.508*	-7.824*

* indicates that the corresponding null hypothesis of a unit root has been rejected at the 1 per cent significance level.
# indicates that the corresponding null hypothesis of a unit root has not been rejected.

With the exception of the ADF test conducted with a constant in regard to Adelaide, none of the tests raise concerns that the NIM is nonstationary in any of the cities. The NIM series for Melbourne and Sydney are thus stationary.

In regard to Adelaide, it is important to bear in mind that the ADF test is biased towards nonrejection of the unit root in the presence of structural change.[487] Given the NIM is being used to test for evidence of possible

[485] The appropriate lag length was chosen using the Newey-West data-based automatic bandwidth parameter method in Eviews.
[486] The ADF and PP tests use different methods to control for higher-order serial correlation in the series. The ADF test controls for higher-order serial correlation by adding lagged difference terms of the dependent variable. The PP test uses a nonparametric method to control for higher order serial correlation in a series.
[487] See: Perron, P. (1989) The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. *Econometrica* 57, 1361-1401; Perron, P. (1990) Testing for a Unit Root in a Time Series with a Changing Mean. *Journal of Business & Statistics* 8, 153-162.

structural change in relation to the termination of REAs, caution should be exercised in not rejecting the null hypothesis of a unit root in relation to the NIM series. As previously observed, there could also be other instances of structural change impacting upon the NIM series rather than just a single episode due to the termination of REAs.

On the basis of the Akaike Information Criterion (AIC)[488] and the Schwarz Criterion (SC)[489] for both the ADF and PP tests, one could conclude that the correct unit root test specification for Adelaide is the one that includes a constant with a linear trend term as opposed to the specification with only the constant term. On this basis, the null hypothesis of a unit root for the NIM in Adelaide is rejected. This suggests that the NIM in Adelaide does exhibit a (negative) linear time trend. On the other hand, utilising the AIC and SC results for both the ADF and PP tests in relation to Sydney and Melbourne, suggests that neither city displays a linear time trend. Thus, in regard to Adelaide, the conclusion is that the NIM series is stationary.

On the basis of the ADF and PP test results, it is concluded that the NIM is stationary, or I(0), in all three cities. Therefore, the ARIMA specification for Sydney is identified as (1, 0, 0), for Melbourne as (1, 0, 0), and for Adelaide as either a (1, 0, 0) process or a (2, 0, 0) process.

6.6.2 Specification of Dummy Variables

In estimating a model for each of the three cities under investigation, it was decided to include a number of dummy variables to account for several

[488] The AIC is often used for model selection for non-nested alternatives, with smaller values of the AIC being preferred.
[489] The SC is an alternative to the AIC for model selection purposes. The SC imposes a larger penalty than the AIC for the inclusion of additional parameters in a model.

other potential periods of structural change. Dummy variables usually take two general forms. One form is known as a step function where an intervention results in a sudden and permanent change in the time series data. Another form is known as a pulse function where an intervention has a temporary effect on the time series data before it returns to a steady state.

The specification of the dummy variables used is outlined below. Further details on the specification of two of these dummy variables is provided in Appendix 4.

6.6.2.1 Regulation and Deregulation of Wholesale Petrol Prices

The regulation and deregulation of wholesale petrol prices was previously described in Chapter 2.

In order to account for a possible gradual adjustment process in the transition from a period of regulation into deregulation of wholesale petrol prices in August 1998, a number of prolonged pulse dummy variables have been included as explanatory variables covering the period from June 1997 until June 1999, to account for changes in the NIM series arising from any adjustment process.

The prolonged pulse dummy variable *Regulation*, covering the period in which wholesale petrol prices were subject to regulation, is used in Adelaide and Sydney and takes the value of 1 in the period from the week beginning 30 June 1997 until the week beginning 27 July 1997 and zero otherwise.

In Melbourne, it has been decided to include two prolonged pulse dummy variables to cover the period of regulation in order to take account for the

lack of price discounting observed in the retail market during the second half of 1997. The dummy variable *Regulation*$_1$, takes the value of 1 in the period from the week beginning 30 June 1997 until the week beginning 22 December 1997 and zero otherwise. The dummy variable *Regulation*$_2$, takes the value of 1 in the period from the week beginning 29 December 1997 until the week beginning 27 July 1998 and zero otherwise.

There are two prolonged pulse dummy variables covering the period of deregulation from August 1998 until the end of June 1999 for all three cities. The dummy variable *Deregulation*$_1$, takes the value of 1 in the period from the week beginning 3 August 1998 until the week beginning 28 December 1998 and zero otherwise. The dummy variable *Deregulation*$_2$, takes the value of 1 in the period from the week beginning 4 January 1999 until the week beginning 21 June 1999 and zero otherwise.

6.6.2.3 Refinery Merger Discussions

A spike is observable across all three cities coinciding with media reports of discussions between Shell and Caltex regarding plans to merge their refineries into a joint venture company. On 15 March 2000 an article in *The Australian* newspaper reported that:

> Oil giants Shell and Caltex are believed to be discussing plans to merge their refineries into a joint venture company to help mitigate the cost of meeting tough new sulphur emission standards...
>
> Shell spokesman Rob Hart said the company was talking to a number of industry players but would not confirm whether the

discussions included Caltex. A Caltex spokesman was unavailable for comment.[490]

It appears that the normal discounting cycle observed across all three capital city retail petrol markets was muted during this period. However, it appears the discounting cycle returned to normal shortly after Shell publicly announced the outcome of a study on its future manufacturing and supply arrangements in New South Wales that began in November 1999.[491] The outcome of the study was that Shell's Clyde refinery in Sydney would not close in 2001 and was likely to remain operating for the medium term.[492]

Due to the observed distortion across all three capital city retail petrol markets that occurred during this period, it was decided to control for this event through the inclusion of a prolonged pulse dummy variable *Merger*. For Adelaide and Melbourne, *Merger* took on the value of 1 during the week beginning 20 March 2000 until the week commencing 27 March 2000 and zero otherwise, and in Sydney, *Merger* took on the value of 1 during the week beginning 13 March 2000 until the week commencing 3 April 2000 and zero otherwise.

6.6.2.3 Blockade of Melbourne Fuel Terminals in Late September 2000

A brief spike in the NIM occurred during and in aftermath of a blockade of Melbourne fuel terminal facilities in late September 2000.

In order to account for the period of the Melbourne fuel blockade, a prolonged pulse dummy variable *Blockade*, takes the value of 1 from the

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[490] *The Australian, op.cit.*
[491] The Shell Company of Australia Limited (2000) Shell Clyde Refinery Future. *Media Release*, 23 March.
[492] *ibid.*

week beginning 25 September 2000 until the week beginning 9 October 2000 and zero otherwise. Further details on this event are provided in Appendix 4.

6.6.2.4 Christmas 2000

A spike in the level of the NIM occurs in Adelaide, Melbourne and Sydney over the Christmas and New Year holiday period during 2000.

This period is treated as an unusual event and will be controlled for. A prolonged pulse dummy variable *Christmas2000*, has been included, which takes on the value of 1 from the week beginning 11 December 2000 until the week beginning 18 December in Adelaide and zero otherwise, and in Melbourne and Sydney which takes on the value of 1 from the week beginning 11 December 2000 until the week beginning 1 January 2001 and zero otherwise. Further details on this event are provided in Appendix 4.

6.6.2.5 Victorian Terminal Gate Pricing Legislation

Details of the Victorian terminal gate pricing legislation were provided in Chapter 2. The ACCC reported in 2003 that some oil companies had commented to them that the *Petroleum Products (Terminal Gate Pricing) Act 2000* had imposed administrative costs on them.[493]

In order to account for a possible change in the NIM due to the Victorian Government's terminal gate pricing legislation, a step function dummy variable *TG*, takes the value of 1 from the week beginning 6 August 2001 onwards.

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[493] Australian Competition and Consumer Commission, *Terminal gate pricing arrangements in Australia*, p. 4.

6.6.2.6 Iraq War

A spike occurs in the NIM for both the Melbourne and Sydney retail petrol markets coinciding with the lead-up to and the period of major hostilities of the 2003 Iraq war.

The Iraq war commenced on 19 March 2003, with major combat operations finishing on 15 April 2003 when the multinational force mostly took control of Tikrit, the last major city in central Iraq.

It appears that the normal discounting cycle observed in the Sydney retail petrol market was muted during the period of the Iraq war. The NRMA observed that with the conclusion of fighting in Iraq that "[w]e have ... seen the return of the weekly discounting cycle in Sydney".[494] A similar impact has also been observed in relation to the Melbourne retail petrol market.

Due to the observed distortion in the Melbourne and Sydney retail petrol markets that occurred during the period of the Iraq war, it was decided to control for this event through the inclusion of a prolonged pulse dummy variable *Iraq*. In Melbourne, *Iraq* took on the value of 1 during the week beginning 24 March 2003 until the week commencing 7 April 2003 and zero otherwise, and in Sydney, *Iraq* took on the value of 1 during the week beginning 17 March 2003 until the week commencing 14 April 2003 and zero otherwise.

6.6.2.7 Coles Myer and Shell Alliance

A trough in the NIM occurs in Melbourne in the lead-up to and during the first few weeks of operation of the commercial alliance between grocery

[494] National Road Motorists Association (2003) Petrol prices return to pre-war levels. *Media release*, 7 May.

retailer Coles and Shell at the end of July 2003. Details on this commercial alliance were provided in Chapter 2.

It is likely that the NIM trough observed during July and early August in Melbourne reflects a period of intensified price discounting activity triggered by the commencement of the commercial alliance that had been foreshadowed in May 2003. Anecdotal evidence for this contention is provided by the fact that the NIM trough reaches its lowest point in the week commencing 28 July 2003, when the commercial alliance came into operation.

Due to the observed distortion in the Melbourne retail petrol market that occurred during the lead-up and commencement of the commercial alliance, it was decided to control for this event through the inclusion of a prolonged pulse dummy variable *Coles*, which took on the value of 1 during the week commencing 7 July 2003 until the week commencing 11 August 2003 and zero otherwise.

6.6.2.8 Termination of REAs

The main dummy variable of interest is the impact arising from the termination of REAs. In order to test for the impact on the NIM in Adelaide, Melbourne, and Sydney arising from the termination of REAs, a step function dummy variable, *exREAs*, has been included in all three cities. In Adelaide, *exREAs* takes the value of 1 in the week beginning 3 January 2000 onwards. In Melbourne and Sydney, *exREAs* takes the value of 1 in the week beginning 1 July 2002 onwards.

6.6.3 Estimation Process for Adelaide

In diagnostic testing of the residuals from a regression, several tests can be performed. The ACF and PACF of the residuals can be checked to ensure that there are no significant autocorrelations nor significant partial autocorrelations. The Ljung and Box Q statistic tests whether the values generated by the ACF of the residuals are simultaneously equal to zero in that they are white noise[495] or if the residuals are autocorrelated.[496] The Ljung and Box Q statistic is used as a test for the lack of fit within ARMA models, and is often referred to as a portmanteau test. The Breusch-Godfrey Lagrange multiplier test (LM test) for autocorrelation is used to test for autocorrelation in the residuals at various intervals. The Breusch-Godfrey LM test for first order autocorrelation is also known as Durbin's m test. The White Heteroscedasticity test is a LM test that is a general test for the presence of heteroscedasticity in the residuals.[497]

An ordinary least squares (OLS) regression for Adelaide NIM with an ARIMA (1,0,0) specification was initially estimated as equation 1. However, equation 1 was found to be deficient based on diagnostic tests. The correlogram shows autocorrelation in the residuals at lag 2 (reported in Appendix 5), while the Ljung and Box Q-statistics of the residuals (reported in Appendix 5) and the Breusch-Godfrey LM test for autocorrelation (reported below in table 13) for equation 1 were statistically significant,

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[495] The residuals will be white noise in the event they do not exhibit autocorrelation and they are also independent of one another.

[496] Ljung, G. M. and Box, G. E. P. (1978) On Measure of Lack of Fit in Time Series Models. *Biometrika* 65, 297-303.

[497] Heteroscedasticity is unequal variance in the residuals. The White Heteroscedasticity test is described as a general test because it makes no assumptions about the form of the heteroscedasticity.

suggesting that the model possessed autocorrelation and had been mis-specified.

An OLS regression for Adelaide NIM was re-estimated with an ARIMA (2,0,0) specification as equation 2. The diagnostic tests of equation 2 indicate the absence of autocorrelation. The correlograms of the resulting residuals for equation 2 are statistically quite acceptable (reported in Appendix 5). None of the autocorrelations of the residuals are statistically significant. Likewise, none of the partial autocorrelations of the residuals are statistically significant, except for that at lag 33 which is likely to be spurious correlation. The estimated Ljung and Box Q-statistics (up to 36 lags) (reported in Appendix 5), and the Breusch-Godfrey LM test for autocorrelation up to 4 lags (reported below in table 13) are not statistically significant, suggesting that the model does not possess autocorrelation.

Table 13: Breusch-Godfrey Lagrange Multiplier Test for Autocorrelation for Equations 1 and 2

Number of Lags	Equation 1 Obs*R-squared	Equation 1 Probability	Equation 2 Obs*R-squared	Equation 2 Probability
1 lag	7.132*	0.008	0.230	0.632
2 lags	8.332*	0.016	2.419	0.298
3 lags	8.366*	0.039	3.681	0.298
4 lags	8.975	0.062	3.702	0.448

*Statistically significant at the 5 per cent level.

The White Heteroscedasticity test reveals the null hypothesis for the non-presence of heteroscedasticity has been accepted at the 5 per cent level.

The estimated t-statistics on the constant and all of the explanatory variables for equation 2 are statistically significant at less than 1 per cent with the exception of $Deregulation_2$ which is statistically significant at less than

5 per cent. The inverted AR roots have a modulus of less than one, suggesting that the estimated model is stationary.

From the OLS modelling, it thus appears that the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level for Adelaide. This result provides evidence that there has been a structural change in the average level of the NIM between the six month period preceding the termination of REAs and the period following the termination of REAs from the beginning of 2000. Furthermore, it suggests that the step function dummy variable *exREAs* provides a good representation of the data.

The results for equations 1 and 2 are reported in table 14 below.

Table 14: OLS Regressions of Adelaide NIM (t-statistics in brackets)

Variable	Equation 1	Equation 2
Constant	4.818 (16.293)*	4.819 (19.531)*
Regulation	1.137 (3.121)*	1.152 (3.813)*
Deregulation1	1.352 (3.078)*	1.385 (3.767)*
Deregulation2	0.716 (1.714)	0.714 (2.020)*
exREAs	-0.982 (-2.763)*	-0.989 (-3.316)*
Merger	2.685 (3.415)*	2.746 (3.374)*
Christmas2000	3.962 (5.033)*	3.564 (4.282)*
AR(1)	0.397 (5.844)*	0.478 (6.519)*
AR(2)	-	-0.207 (-2.748)*
R-squared	0.567	0.586
Adjusted R-squared	0.550	0.567
AIC	2.801	2.772
SC	2.937	2.926
F-statistic	34.175*	31.962*
White's Heteroscedasticity Test	11.623	12.169
Inverted AR Roots	.40	.24 +.39i .24 -.39i

*Statistically significant at the 5 per cent level.

6.6.4 Estimation Process for Melbourne

An OLS regression for Melbourne NIM with an ARIMA (1,0,0) specification was estimated as equation 3.

Diagnostic tests performed on the residuals of equation 3 indicate the absence of autocorrelation. The correlograms of the residuals (reported in Appendix 6) for the estimated equation are statistically quite acceptable. None of the autocorrelations of the residuals are statistically significant, except for those at lags 6 and 30 and this is most likely spurious correlation. None of the partial autocorrelations of the residuals are significant, except for those at lags 6, 10, 27 and 30 which are likely to be spurious correlation.

The estimated Ljung and Box Q-statistics (up to 36 lags) (reported in Appendix 6) and the Breusch-Godfrey LM test for autocorrelation up to 4 lags (reported in table 15 below) are not statistically significant, suggesting that the model does not possess autocorrelation.

The estimated t-statistics on the constant and all explanatory variables are statistically significant at less than 1 per cent and the inverted AR root has a modulus of less than one, suggesting that the estimated model is stationary.

Table 15: Breusch-Godfrey Lagrange Multiplier Test for Autocorrelation for Equation 3

Number of Lags	Obs*R-squared	Probability
1 lag	1.554	0.213
2 lags	1.557	0.459
3 lags	3.045	0.385
4 lags	3.046	0.550

However, the White Heteroscedasticity test reveals that the null hypothesis for the non-presence of heteroscedasticity has to be rejected at the 1 per cent level. While the presence of heteroscedasticity in the regression does not cause bias nor inconsistency in the parameter estimates, it does invalidate the standard errors, t-statistics, and F-statistics because the standard errors and the confidence intervals calculated will be too narrow.

There are two general approaches to addressing heteroscedasticity in regression models. One method is to calculate robust standard errors. Provided that the sample size is large, then robust standard errors give quite a good estimate of standard errors even in the presence of heteroscedasticity which then allows statistical inferences to be made about the true parameter

value.[498] The other alternative is to explicitly model to account for the heteroscedasticity.

Equation 3 was re-estimated using heteroscedasticity-robust standard errors as proposed by White.[499] The estimated t-statistics on the constant and all explanatory variables from the regression are still statistically significant at less than 1 per cent after allowing for heteroscedasticity through the calculation heteroscedasticity-robust standard errors.

Equation 3 was also re-estimated using the heteroscedasticity and autocorrelation-consistent (HAC) standard errors as developed by Newey and West.[500] This will ensure that the standard errors are robust in the event of both heteroscedasticity and autocorrelation of an unknown form. The estimated t-statistics on the constant and all of the explanatory variables from the regression are still statistically significant at less than 1 per cent after allowing for both heteroscedasticity and autocorrelation through the calculation of HAC standard errors.

From the OLS modeling, it thus appears that the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level. This result provides evidence that there has been a structural change in the average level of the NIM between the eleven month period preceding the termination of REAs associated with the Victorian terminal gate pricing legislation and the period following the termination of REAs from July

[498] Engle, R. (2001) GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics. *The Journal of Economic Perspectives* 15, 157-168, p. 158.
[499] White, H. (1980) A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica* 48, 817-838.
[500] Newey, W. K. and West, K. D. (1987) Hypothesis Testing with Efficient Method of Moments Estimation. *International Economic Review* 28, 777-787.

2002. Furthermore, it suggests that the step function dummy variable *exREAs* provides a good representation of the data.

The results for equation 3 are reported in table 16 below.

Table 16: OLS Regressions of Melbourne NIM (t-statistics in brackets)

Variable	Equation 3	Equation 3 (White's heteroscedasticity-robust standard errors)	Equation 3 (HAC standard errors)
Constant	3.375 (15.960)*	3.375 (15.618)*	3.375 (15.183)*
Regulation$_1$	3.063 (6.334)*	3.063 (6.123)*	3.063 (6.312)*
Regulation$_2$	1.701 (3.931)*	1.701 (4.907)*	1.701 (4.983)*
Deregulation$_1$	2.177 (4.471)*	2.177 (7.494)*	2.177 (6.737)*
Deregulation$_2$	1.389 (3.017)*	1.389 (2.792)*	1.389 (3.011)*
Merger	2.608 (2.736)*	2.608 (7.911)*	2.608 (13.271)*
Blockade	3.654 (4.161)*	3.654 (10.023)*	3.654 (16.120)*
Christmas2000	4.144 (5.031)*	4.144 (4.297)*	4.144 (8.775)*
TG	1.661 (4.460)*	1.661 (3.704)*	1.661 (3.199)*
exREAs	1.529 (3.660)*	1.529 (3.422)*	1.529 (2.902)*
Iraq	3.117 (3.527)*	3.117 (3.139)*	3.117 (5.198)*
Coles	-2.745 (-3.694)*	-2.745 (-3.028)*	-2.745 (-3.380)*
AR(1)	0.472 (9.287)*	0.472 (7.824)*	0.472 (7.778)*
R-squared	0.644		
Adjusted R-squared	0.630		
AIC	3.181		
SC	3.334		
F-statistic	46.367*		
White's Heteroscedasticity Test	29.583*		
Inverted AR Roots	.47		

*Statistically significant at the 5 per cent level.

The model is now re-estimated through modelling for the heteroscedasticity. The autocorrelations and partial autocorrelations of the squared residuals and their resulting correlograms and the Ljung-Box Q-statistics of the

squared residuals are used to check for the presence of autoregressive conditional heteroscedasticity (ARCH) in the residuals. Provided that the Gauss-Markov assumptions hold, OLS estimates in the presence of ARCH still represent the best linear unbiased estimator (BLUE).[501] However, in the identification of ARIMA models, the presence of ARCH will lead to models that are over-parameterised.[502]

Inspection of the autocorrelation and partial correlations of the squared residuals and the Ljung and Box Q-statistic from the OLS regression (reported in Appendix 6) reveals the null hypothesis that the model does not exhibit ARCH in the residuals has to be rejected. The autocorrelations and the partial autocorrelations of the squared residuals are statistically significant at lag 1. The Ljung and Box Q-statistics are statistically significant for autocorrelation in the squared residuals at lags 2, 3 and 4 and from lag 12 onwards.

The next step is to develop a model that appropriately models the ARCH. It was found that the ARCH(1) configuration was the preferred specification. ARCH(1) models take the following form:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2$$

where 'σ_t^2' is the variance at time 't', 'α_0' is a constant, and 'ε_{t-1}^2' is the square of the residual at time 't-1' with 'α_1' as its estimated coefficient.

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[501] Wooldridge, J. M. (2003) *Introductory Econometrics: A Modern Approach*. Thomson South-Western, Australia, p. 416.
[502] Mills, T. C. (1990) *Time series techniques for economists*. Cambridge University Press, Cambridge.

The model for Melbourne was re-estimated using the ARCH(1) specification by the method of maximum likelihood (ML) as equation 4.[503]

Diagnostic tests demonstrate that the outcomes from this ARIMA ARCH intervention model are statistically quite acceptable. None of the autocorrelations of the residuals are statistically significant, except for those at lags 17 and 30 and this is most likely spurious correlation (reported in Appendix 6). Similarly, none of the partial autocorrelations of the residuals are statistically significant, except for those at lags 6, 27 and 30 which are likely to be spurious correlation (reported in Appendix 6). None of the estimated Ljung and Box Q-statistics for autocorrelation in the residuals are statistically significant (reported in Appendix 6).

Tests fail to detect the presence of any heteroscedasticity. None of the autocorrelation nor partial autocorrelation functions of the squared residuals are statistically significant, except for those at lags 14, 17 and 20 which are likely to be spurious correlation (reported in Appendix 6). None of the estimated Ljung and Box Q-statistics for autocorrelation in the squared residuals are statistically significant (reported in Appendix 6).

Another method used to detect the presence of ARCH is the LM test for ARCH. The LM test for ARCH in the residuals up to eight lags fails to identify the presence of ARCH and the results are reported below in table 17.

[503] This was estimated using a Berndt, Hall, Hall and Hausman iterative algorithm.

Table 17: Lagrange Multiplier Test for Autoregressive Conditional Heteroscedasticity for Equation 4

Number of Lags	Obs*R-squared	Probability
1 lag	2.504	0.114
2 lags	2.500	0.287
3 lags	4.579	0.205
4 lags	5.318	0.256
5 lags	5.545	0.353
6 lags	6.356	0.385
7 lags	5.729	0.572
8 lags	6.064	0.640

In undertaking ML estimation, it is assumed that the residuals are normally distributed. Hence, it is important to test the assumption of the normality of the residuals to determine whether this underlying assumption in the use of ML estimation has been violated. Based on the Jarque-Bera test on the residuals reported below, the null hypothesis that the residuals are normally distributed is rejected.

Jarque-Bera = 8.184 Probability = 0.017

If the residuals are not conditionally normally distributed, the ARCH parameter estimates will still be consistent provided that the mean and variance functions have been correctly specified, but the standard errors will be incorrect. In order to rectify for this possible shortcoming, equation 4 was re-estimated using quasi-maximum likelihood standard errors through the method described by Bollerslev and Wooldridge.[504]

The constant and all of the explanatory variables in the estimated mean equation for equation 4 are statistically significant at less than 1 per cent. The inverted AR root has a modulus of less than one, suggesting that the estimated model is stationary.

[504] Bollerslev, T. and Wooldridge, J. M. (1992) Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time-Varying Covariances. *Econometric Reviews* 11, 143-172.

From the ML modelling the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level. This result provides further evidence that there has been a structural change in the average level of the NIM between the eleven month period preceding the termination of REAs associated with the Victorian terminal gate pricing legislation and the period following the termination of REAs from July 2002. It also suggests that the step function dummy variable *exREAs* provides a good representation of the data.

In the variance equation for equation 4, the constant and the estimated coefficient on the 'σ_{t-1}^2' term are both statistically significant at less than 1 per cent.

The results for equation 4 are reported in table 18 below.

Table 18: ML Regression of Melbourne NIM (z-statistics in brackets)

Variable	Equation 4 (quasi-maximum likelihood standard errors)
Constant	3.391 (18.495)*
Regulation$_1$	2.704 (5.502)*
Regulation$_2$	1.580 (5.572)*
Deregulation$_1$	2.152 (7.862)*
Deregulation$_2$	1.092 (2.589)*
Merger	2.604 (7.952)*
Blockade	3.703 (8.867)*
Christmas2000	4.698 (3.925)*
TG	1.633 (4.347)*
exREAs	1.584 (4.104)*
Iraq	3.298 (2.860)*
Coles	-2.701 (-3.500)*
AR(1)	0.444 (8.750)*
α_0	0.991 (7.637)*
ε_{t-1}^2	0.436 (5.201)*
R-squared	0.641
Adjusted R-squared	0.625
AIC	3.202
SC	3.379
F-statistic	39.071*
Inverted AR Roots	.44

*Statistically significant at the 5 per cent level.

The ARCH(1) model produces estimates for the constant and for the coefficients of the explanatory variables very similar in magnitude to those estimated by the OLS model, with the possible exception of *Christmas2000*.

6.6.5 Estimation Process for Sydney

An OLS regression for Sydney NIM with an ARIMA (1,0,0) specification was estimated as equation 5.

Diagnostic tests performed on the residuals of equation 5 indicate the absence of autocorrelation. The correlograms of the residuals (reported in Appendix 7) for the estimated equation are statistically quite acceptable. None of the autocorrelations of the residuals are statistically significant, except for those at lags 18, 19, 20 and 24 and this is most likely spurious correlation. None of the partial autocorrelations of the residuals are significant, except for those at lags 18, 19, and 20 which are likely to be spurious correlation. The estimated Ljung and Box Q-statistics (up to 36 lags) (reported in Appendix 7) and the Breusch-Godfrey LM test for autocorrelation up to 4 lags (reported in table 19 below) are not statistically significant, suggesting that the model does not possess autocorrelation.

The estimated t-statistics on the constant and all explanatory variables are statistically significant at less than 1 per cent and the inverted AR root has a modulus of less than one, suggesting that the estimated model is stationary.

Table 19: Breusch-Godfrey Lagrange Multiplier Test for Autocorrelation for Equation 5

Number of Lags	Obs*R-squared	Probability
1 lag	0.510	0.475
2 lags	0.549	0.760
3 lags	0.593	0.898
4 lags	2.092	0.719

The White Heteroscedasticity test reveals that the null hypothesis for the non-presence of heteroscedasticity has to be rejected at the 1 per cent level.

Equation 5 was re-estimated using heteroscedasticity-robust standard errors. With the exception of *Christmas2000*, whose estimated t-statistic is still statistically significant at less than 5 per cent, the estimated t-statistics on the constant and all of the other explanatory variables are statistically

significant at less than 1 per cent after allowing for heteroscedasticity through the calculation of heteroscedasticity-robust standard errors.

Equation 5 was then re-estimated using HAC standard errors in order to ensure that the standard errors are robust in the event of both heteroscedasticity and autocorrelation of an unknown form. The estimated t-statistics on the constant and all of the explanatory variables from the regression are statistically significant at less than 1 per cent after allowing for both heteroscedasticity and autocorrelation through the calculation of HAC standard errors.

From the OLS modelling, it thus appears that the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level. This result provides evidence that there has been a structural change in the average level of the NIM between the three year period preceding the termination of REAs and the period following the termination of REAs from July 2002. Furthermore, it suggests that the step function dummy variable *exREAs* provides a good representation of the data.

The results for equation 5 are reported in table 20 below.

Table 20: OLS Regressions of Sydney NIM (t-statistics in brackets)

Variable	Equation 5	Equation 5 (White's heteroscedasticity-robust standard errors)	Equation 5 (HAC standard errors)
Constant	4.496 (26.820)*	4.496 (21.915)*	4.496 (24.686)*
Regulation	2.557 (7.862)*	2.557 (9.560)*	2.557 (8.312)*
Deregulation$_1$	2.605 (5.929)*	2.605 (8.453)*	2.605 (7.420)*
Deregulation$_2$	1.600 (3.855)*	1.600 (4.506)*	1.600 (3.498)*
Merger	2.868 (4.124)*	2.868 (3.566)*	2.868 (6.161)*
Christmas2000	3.028 (4.325)*	3.028 (2.165)*	3.028 (4.576)*
exREAs	2.130 (6.841)*	2.130 (7.649)*	2.130 (6.374)*
Iraq	2.727 (4.062)*	2.727 (3.221)*	2.727 (3.714)*
AR(1)	0.546 (11.374)*	0.546 (10.251)*	0.546 (9.283)*
R-squared	0.721		
Adjusted R-squared	0.714		
AIC	2.779		
SC	2.884		
F-statistic	100.897*		
White's Heteroscedasticity Test	41.041*		
Inverted AR Roots	.55		

*Statistically significant at the 5 per cent level.

The model is now re-estimated through modelling for the heteroscedasticity. Inspection of the autocorrelation and partial correlations of the squared residuals and the Ljung and Box Q-statistic reveals the hypothesis that the model does not exhibit ARCH in the residuals has to be rejected (reported in Appendix 7). The autocorrelations and the partial autocorrelations of the squared residuals are statistically significant from lags 1 to 5. The Ljung and Box Q-statistics are statistically significant for autocorrelation in the squared residuals from lag 1 onwards.

The next step was to develop a model that appropriately models the ARCH. It was found that the Generalised ARCH (GARCH) with a GARCH(1,1)

configuration was the preferred specification. GARCH (1,1) models take the following form:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

where 'σ_t^2' is the variance at time 't', 'α_0' is a constant, 'ε_{t-1}^2' is the square of the residual at time 't-1' with 'α_1' as its estimated coefficient, and 'σ_{t-1}^2' is the variance at time 't-1' with 'β_1' as its estimated coefficient.

The model for Sydney was re-estimated using the GARCH(1,1) specification by the ML method as equation 6.[505]

Diagnostic tests demonstrate that the outcomes from this ARIMA ARCH intervention model are statistically quite acceptable. None of the autocorrelations of the residuals are statistically significant (reported in Appendix 7). Similarly, none of the partial autocorrelations of the residuals are statistically significant except for that at lag 30 which is likely to be spurious correlation (reported in Appendix 7). None of the estimated Ljung and Box Q-statistics for autocorrelation in the residuals are statistically significant (reported in Appendix 7).

Tests fail to detect the presence of any heteroscedasticity. None of the autocorrelation nor partial autocorrelation functions of the squared residuals are statistically significant except for that at lag 15 which is likely to be spurious correlation (reported in Appendix 7). None of the estimated Ljung and Box Q-statistics for autocorrelation in the squared residuals are statistically significant (reported in Appendix 7). The LM test for ARCH in

[505] This was estimated using a Marquardt iterative algorithm.

the residuals up to eight lags fails to identify the presence of ARCH and the results are reported below in table 21.

Table 21: Lagrange Multiplier Test for Autoregressive Conditional Heteroscedasticity for Equation 6

Number of Lags	Obs*R-squared	Probability
1 lag	0.017	0.898
2 lags	0.327	0.849
3 lags	0.584	0.900
4 lags	1.229	0.873
5 lags	1.402	0.924
6 lags	1.497	0.960
7 lags	1.895	0.965
8 lags	1.944	0.983

However, based on the Jarque-Bera test on the residuals reported below, the null hypothesis that the residuals are normally distributed for equation 6 has to be rejected.

Jarque-Bera = 9.956 Probability = 0.007

In order to rectify for this possible shortcoming, equation 6 was re-estimated using quasi-maximum likelihood standard errors through the method described by Bollerslev and Wooldridge.

The mean equation for equation 6 using the quasi-maximum likelihood standard errors shows that the estimated constant and all of the estimated explanatory variables are statistically significant at less than 1 per cent with the exception of *Christmas2000* which is not statistically significant at 5 per cent level. The inverted AR root has a modulus of less than one, suggesting that the estimated model is stationary.

In the variance equation for equation 6, the estimated coefficients on both the 'σ_{t-1}^2' term and the 'ε_{t-1}^2' term are statistically significant at less than 1

per cent, while the constant term is not statistically significant at the 5 per cent level.

An important feature of the variance equation for equation 6 is that the sum of the 'α_1' and 'β_1' coefficients is only marginally less than 1, which indicates that the modelled variance demonstrates persistence in that it takes a long time to die out asymptotically. Bollerslev, Engle and Nelson have observed in relation to GARCH(1,1) models that in most empirical applications with finely sampled data that the sum of the 'α_1' and 'β_1' coefficients of close to one "is found to provide a good description of the data".[506]

From the ML modeling the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level. This result provides further evidence that there has been a structural change in the average level of the NIM between the three year period preceding the termination of REAs and the period following the termination of REAs from July 2002. It also suggests that the step function dummy variable *exREAs* provides a good representation of the data.

The results for equation 6 are reported in table 22 below.

[506] Bollerslev, T., Engle, R. F., and Nelson, D. B. (1994) ARCH Models. In Engle, R. F. and McFadden, D. L. (eds.) *Handbook of Econometrics: Volume 4*. Elsevier Science Publishers B. V., Amsterdam, 2959-3038, p. 2669.

Table 22: ML Regression of Sydney NIM (z-statistics in brackets)

Variable	Equation 6 (quasi-maximum likelihood standard errors)
Constant	4.601 (21.678)*
Regulation	2.446 (9.029)*
$Deregulation_1$	2.549 (7.803)*
$Deregulation_2$	1.578 (4.936)*
Merger	3.712 (3.481)*
Christmas2000	3.129 (1.861)
exREAs	2.077 (7.703)*
Iraq	3.828 (3.122)*
AR(1)	0.587 (13.519)*
α_0	0.033 (1.494)
ε_{t-1}^2	0.143 (2.904)*
σ_{t-1}^2	0.833 (13.829)*
R-squared	0.715
Adjusted R-squared	0.705
AIC	2.607
SC	2.748
F-statistic	70.589*
Inverted AR Roots	.59

*Statistically significant at the 5 per cent level.

With the exception of the *Merger* and the *Iraq* explanatory variables, the GARCH(1,1) model produces estimates of the constant and for the coefficients of the explanatory variables very similar in magnitude to those estimated by the OLS model.

6.7 Sensitivity Analysis

The sensitivity of the models for all three cities has been tested by OLS by excluding the autoregressive terms using HAC standard errors to account for likely autocorrelation and heteroscedasticity. The results have been

reported in Appendix 8 as equations A8.1 for Adelaide, A8.2 for Melbourne and A8.3 for Sydney.

The estimated models remain robust with the constant and all coefficients on the explanatory variables statistically significant at less than the 1 per cent level. The modelling shows that the main variable of interest, *exREAs*, is statistically significant at less than the 1 per cent level for all three cities. These results provide further evidence that there has been a structural change in the average level of the NIM between the period preceding the termination of REAs and the period following the termination of REAs and suggests that the step function dummy variable *exREAs* provides a good representation of the data for all three cities.

It is also important to note that the R-squared (and adjusted R-squared) is not higher than the Durbin-Watson statistic reported for all three cities, which suggests that these models are not cases of spurious regression according to the criterion suggested by Granger and Newbold.[507]

It was noted in section 6.4 above that the NIM for Melbourne and Sydney appeared to be trending upwards from around mid-2000. In this case, there is the possibility that the dummy variables picking up the impact associated with the Victorian terminal gate pricing legislation in Melbourne and the abolition of REAs in regard to Melbourne and Sydney could be picking up pre-existing trends, thus casting doubt over the validity of the results. Any such trend from mid-2000 could be associated with the introduction of the GST. A further sensitivity analysis was conducted through the inclusion of a

[507] Granger, C. W. J. and Newbold, P. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2, 111-120.

new dummy variable *GST* for all three cities to determine whether the results for *exREAs* could simply be reflecting a pre-existing trend in the data. For Adelaide, *GST* takes the value of 1 from the week beginning 3 July 2000 onwards. For Melbourne, *GST* takes for the value of 1 from the week beginning 3 July 2000 until the week beginning 30 July 2001 and zero thereafter. For Sydney, *GST* takes the value of 1 from the week beginning 3 July 2000 until the week beginning 24 June 2002 and zero thereafter.

These sensitivity analysis models have been estimated by OLS using heteroscedasticity-robust standard errors and HAC standard errors to account for any autocorrelation and (likely) heteroscedasticity in the models.[508] These results have been reported in Appendix 8 as equations A8.4 for Adelaide, A8.5 for Melbourne and A8.6 for Sydney.

The coefficient on the *GST* explanatory variable is not statistically significant at the 5 per cent level for any of the three cities. This suggests that there is no structural break from mid-2000 onwards from the previous period in regard to any of the three cities. In addition, the sign on the coefficient of the *GST* explanatory variable in all three cities suggests that any time trend in the NIM from mid-2000 onwards was probably negative if it did exist. The impact associated with the termination of REAs in regard to Adelaide remains statistically significant at less than the 5 per cent level under the heteroscedasticity-robust standard errors specification and at less than 1 per cent under the HAC standard errors specification. The impact associated with the termination of REAs in regard to Sydney remains

[508] The White Heteroscedasticity test of the model for Adelaide did reveal that the null hypothesis for the non-presence of heteroscedasticity had to be rejected at the 5 per cent level.

statistically significant at less than the 1 per cent level under both model specifications, while the impact associated with the Victorian terminal gate pricing legislation and the termination of REAs in regard to Melbourne remains statistically significant at less than the 1 per cent level under both model specifications. The implication of these results is that the main variable of interest, *exREAs*, is not picking up trends that started before the abolition of the REAs.

A further sensitivity analysis is provided for Sydney in which the Victorian terminal gate pricing legislation step function dummy variable, *TG*, has been included in the model for Sydney. These equations have been estimated by OLS and are reported in Appendix 9 as equations A9.1 and A9.2. These equations suggest that there was no structural change between the period beginning July 1999 to the end of July 2001 and the period beginning August 2001 to the end of June 2002. Once again, it would appear that the main variable of interest, *exREAs*, is not picking up trends that started before the abolition of the REAs in Sydney. The reason for the specification of equations A9.1 and A9.2 is outlined in Chapter 7.

6.8 Conclusion

From the exploratory data analysis and modelling exercises, it appears that the termination of REAs is associated with a statistically significant effect at less than the 1 per cent level upon the average level of the NIM in Adelaide, Melbourne and Sydney.

In Adelaide, this effect would appear to be negative and associated with a reduction of around 1.0 cpl in the NIM on average. In contrast to Adelaide,

the effect in Melbourne and Sydney would appear to be positive. Therefore the null hypothesis that BEFORE is equal to AFTER in respect of Adelaide is rejected and the alternative hypothesis of H_2 is accepted.

The magnitude of the effect in Melbourne is associated with an increase in the NIM of between 1.5 to 1.6 cpl on average. The magnitude of the effect in Sydney is associated with an increase in the NIM of around 2.1 cpl on average. Thus, in relation to both Melbourne and Sydney, the null hypothesis that BEFORE is equal to AFTER is rejected and the alternative hypothesis of H_1 is accepted.

In this chapter it has been demonstrated that there is a statistically significant effect on the average level of the NIMs associated with the termination of REAs. The next Chapter will provide an interpretation of these results.

Chapter 7: Interpretation

7.1 Introduction

In Chapter 3 it was surmised that the retail sector of the downstream petroleum industry in capital cities was probably retailing petrol at marginal cost due to the motivation on the part of the oil majors to avoid the problem of double marginalisation, an outcome reminiscent of a perfectly competitive market. Under these conditions, movements and changes in retail petrol prices as well as in the NIM should therefore provide insights into the nature of competition at the wholesale level.

This Chapter will interpret the results of the modelling undertaken in Chapter 6. It will do this through examining the constant and the coefficient on each of the explanatory variables estimated in the modelling (with the exception of the autoregressive terms) and consider possible explanations for these results.

While the primary focus is upon interpreting the explanatory variable measuring the effect associated with the termination of REAs, interpretation of the constant along with the other explanatory variables may also provide useful insights into the pattern and nature of competition within the wholesale petrol markets of Adelaide, Melbourne, and Sydney as conveyed through retail petrol prices and changes in the NIM. This information could in turn be beneficial in ensuring that the impact upon wholesale petrol markets arising from the termination of REAs is correctly interpreted.

The interpretation of the explanatory variables measuring the effect associated with the termination of REAs will enable conclusions to be drawn on the likely competitive effects of REAs in the three capital city under consideration. At the conclusion of this Chapter, it is intended to demonstrate that the operation of REAs had a pro-competitive impact on wholesale petrol markets in Melbourne and Sydney and that the operation of REAs in the Adelaide wholesale petrol market was unlikely to have been associated with any anti-competitive detriment.

7.2 Competition in Capital City Wholesale Petrol Markets

As was previously observed in Chapter 2, retail petrol prices in Adelaide, Melbourne and Sydney closely follow each other, and in turn follow movements in the IPI. On this basis, it is reasonable to assume that the capital city retail petrol markets of Adelaide, Melbourne and Sydney, and their associated capital city wholesale petrol markets, behave in a similar manner.

While the wholesale petrol markets under consideration may be considered oligopolistic in nature, as outlined in Chapter 3, there are many alternative theories to explain the conduct of firms in an oligopolistic market. It is therefore important to try to ascertain which theory or theories of oligopoly could be relevant in trying to explain the behaviour and conduct of firms operating within the Adelaide, Melbourne, and Sydney wholesale petrol markets.

One possibility is for wholesale market participants to behave in a tacitly collusive manner as described by Chamberlin, Fellner and Kaysen.[509] In this situation, wholesale market participants would recognize their interdependence and decide it is against their interests to engage in price competition, striking a tacitly collusive arrangement instead. The public comments of politicians and motoring organisations, along with firmly held and widespread public suspicions, provide anecdotal support for this proposition. In addition, the firms operating within the capital city wholesale markets engage in repeated interactions against each other over time, with game theory suggesting this will increase the probability that firms will decide to adopt more co-operative strategies against each other than if they only interacted once as first identified by Friedman.[510] Furthermore, the interaction of the oil majors is not simply confined to one geographic market but to several geographic markets around Australia, thus increasing the incentives to engage in co-operative behaviour with rival firms while reducing the incentives to cheat on any tacitly collusive agreement struck as suggested by Bernheim and Whinston.[511]

Walker and Woodward have observed that the downstream petroleum industry exhibits several of the characteristics identified by Stigler as making it easier to facilitate tacit collusion between rival firms.[512] Petrol, as outlined in Chapter 2, could be considered as a homogeneous product, thus minimising the scope for

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[509] Chamberlin, E. H., *op.cit*; Fellner, W., *op.cit*; Kaysen, C., *op.cit.*
[510] Friedman, J. W., *op.cit.*
[511] Bernheim, B. D., and Whinston, M. D., *op.cit.*
[512] Walker, J. and Woodward, L., *op.cit.*, p. 33.

product differentiation and non-price competition and thereby providing a clear basis upon which a tacitly collusive agreement could be struck, namely the price of petrol. The eventual consumers of the product in motoring consumers are all relatively small purchasers of the product, thus making it a lot less attractive for firms to cheat on any tacitly collusive agreement struck by offering secret price cuts to any customer. The display of petrol price boards at retail service station sites would make it relatively easy to detect and punish any defection from any tacitly collusive agreement struck. Indeed, the former Chairman of the ACCC, Professor Allan Fels, expressed concern that the display of petrol price boards at retail service station sites was a means through which the oil majors could signal to each other.[513]

The downstream petroleum industry also displays several other conditions identified by Posner that arguably make it positively predisposed towards collusion (whether that be tacit or overt).[514] As was concluded in Chapter 2, price competition appears to be the main basis by which firms compete. Furthermore, as outlined in Chapter 2, the downstream petroleum industry has a chequered history in relation to competition law compliance, having been subject to numerous investigations, in addition to several successful as well as unsuccessful prosecutions for breaches of Part IV of the TPA, suggesting that it possesses some predisposition towards anti-competitive conduct.

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[513] 7.30 Report (1999) Petrol Prices. ABC Television, 9 August.
[514] Posner, R. A. *Antitrust Law: An Economic Perspective.*

On the other hand, the downstream petroleum industry also exhibits several characteristics identified by Posner that would appear to mitigate against collusive conduct. In the first instance, wholesale markets, at least in most of the capital cities, possess a fringe of small sellers (independents). Posner observed that any part of the market outside of the colluding circle would impose a limit on the power exercised by the colluding circle over the market price.[515]

Furthermore, as observed in Chapter 6, retail petrol prices in Adelaide, Melbourne and Sydney were often consistently below the level of the IPI, the standard previously used to regulate wholesale petrol prices in Australia. This suggests two possible explanations. The first is that capital city wholesale petrol markets were relatively competitive in that market participants engaged in price competition in order to either build and/or maintain market share. This first explanation is consistent with the conclusions reached by the Industry Commission that "the petroleum product markets have a structure conducive to vigorous competition and not consistent with the persistence of monopoly power".[516] The second explanation is that the IPI was consistently set at a level below the wholesale profit-maximising price if the oil majors had struck a tacitly collusive agreement.

The first explanation appears to be far more plausible than the second explanation because, as outlined in Chapter 2, the retail demand for petrol is

[515] *ibid.*, p. 56.
[516] Industry Commission, *op.cit.*, p. 61.

highly price inelastic. Posner has observed that a monopolist would never sell at a price where the demand is inelastic, as they could simply increase their revenues and profits by reducing their output and raising the product price.[517] If there was indeed a tacitly collusive agreement adhered to within the wholesale petrol markets under consideration flowing through into retail petrol prices, then one would never expect falls in retail prices to occur while petrol demand remained price inelastic unless any tacitly collusive agreement struck had collapsed. Arguably the most significant piece of evidence mitigating against the existence of tacit collusion within wholesale petrol markets is the fact that the demand for petrol is significantly price inelastic at the prevailing retail market price. While Green and Porter[518] have proposed a model of oligopoly where it is possible for tacit collusion to occur in concert with price instability as co-operation breaks down, this model seems inappropriate to explain behaviour in capital city wholesale petrol markets because the price cycles observed at the retail level, conveying information about prices at the wholesale level, are periodic and therefore predictable.[519]

Walker and Woodward have observed that attempts to engage in the co-ordination of prices within the downstream petroleum industry have met with only limited success.[520] This would also accord with the viewpoint proffered by

[517] Posner, R. A., *op.cit.*, p. 69.
[518] Green, E. J. and Porter, R. H., *op.cit.*
[519] Castanias, R. and Johnson, H., *op.cit.*, p. 171.
[520] Walker, J. and Woodward, L., *op.cit.*, p. 34.

Shell in 2001 that "there is simply no evidence of the petroleum industry engaging in monopolistic pricing".[521]

Aside from competition in wholesale petrol markets, there may be several other factors that may have precluded the setting of a monopoly wholesale petrol price. As oil refining is a joint production process of various petroleum products simultaneously, profit maximising from overall refinery production may result in an oversupply of petrol. Wholesale price regulation, which benchmarked Australian wholesale petrol prices to an import parity price from Singapore, could have thwarted attempts to set a monopoly wholesale price at least up until the end of July 1998. Fear of even further government intervention and price controls could have provided sufficient moral suasion against attempts to set a monopoly wholesale price. Even if these factors may have thwarted the setting of a monopoly price for wholesale petrol to some extent through a tacitly collusive agreement, it would still have been irrational for firms to ever lower wholesales petrol prices, flowing through into lower retail petrol prices and the level of the NIM, if there were any inclinations towards co-operation amongst wholesale market participants given the price inelastic demand for retail petrol.

Therefore, the most plausible explanation for reductions in retail petrol prices, as well as for falls in the level of the NIM, is that they did represent genuine attempts by wholesale market participants to compete and build market share

[521] The Shell Company of Australia Limited (2001) *Shell submission to the Review of the Prices Surveillance Act 1983*. Melbourne.

through price discounting at the expense of rivals. If this is indeed the case, there are possibly elements of at least three static oligopoly theories present in capital city wholesale petrol markets as reflected through the normal weekly price cycles observed in capital city retail petrol markets. First, wholesale petrol prices are possibly in a continuous state of perpetual motion between a high and low point as proposed by Edgeworth as reflected through price volatility in capital city retail petrol markets. Second, wholesalers who don't drop their prices in response to price discounting at the retail level gradually lose business to their rivals over time rather than losing all of their business instantaneously as suggested by Hotelling. Third, barometric price leadership provides a possible explanation as to why there is a uniform increase in retail petrol prices at the end of a discounting cycle, with other wholesalers deciding to raise their prices in response to a wholesale price rise by one of their rivals. In terms of a dynamic theory of oligopoly, capital city wholesale petrol markets could be reminiscent of the model proposed by Maskin and Tirole as previously suggested by Castanias and Johnson.[522]

7.3 Wholesale Petrol Markets of Adelaide, Melbourne and Sydney

The impacts upon the competitive environment that occurred over the period under consideration will now be discussed. This is done by interpretation of the constant term and the coefficients on the explanatory variables and their statistical standing from the estimated regressions conducted. The shift effects associated with the blockade of Victorian oil terminals in late September 2000,

[522] Castanias, R. and Johnson, H., *op.cit.*

tight supply conditions across the Australian eastern seaboard during the Christmas and New Year period in 2000, merger discussions between Shell and Caltex in March 2000, the impact of impaired retail discounting behaviour in Melbourne during the second half of 1997, the impact of the 2003 Iraq war, the impact from the entry of Coles into petrol retailing in July and August 2003, wholesale petrol price regulation and deregulation, the Victorian terminal gate pricing legislation, and the impact associated with the termination of REAs and, after the constant term, they are each discussed in turn with conclusions drawn for overall interpretation.

For Adelaide, Melbourne and Sydney, the constant term is statistically significant at less than the 1 per cent level under all model specifications.

The constant term provides a measure of the average base level of the NIM after specific events being accounted for through the other dummy variables are removed from consideration. It also arguably provides an indication of the level of price competition in each of the wholesale petrol markets being examined, as a more intense level of price competition at the wholesale level would presumably equate to a lower average base level for the NIM.

Comparisons of the constant term across the three cities would suggest that Melbourne was generally the most competitive wholesale petrol market because it recorded the lowest value for the NIM at around 3.4 cpl. This finding is consistent with the ACCC's conclusion in 1996 that the Melbourne retail petrol market had the lowest average capital city margin above an import parity

terminal gate price between March 1994 and March 1996.[523] It is also consistent with the ACCC's observation in 2001 that Melbourne had long been regarded as the most competitive of the major capital cities for petrol.[524]

The value of the constant terms would suggest that the Adelaide and Sydney wholesale petrol markets were roughly equivalent in terms of their competitiveness, with the constant term for the NIM estimated at around 4.8 cpl in Adelaide and estimated at between 4.5 cpl and 4.6 cpl in Sydney. This is also consistent with the ACCC's previous finding in 1996 that the Adelaide and Sydney retail petrol markets had similar average capital city margins above an import parity terminal gate price between March 1994 and March 1996.[525]

7.4 *Blockade* and *Christmas2000*

The *Blockade* and *Christmas2000* explanatory variables are statistically significant at less than the 1 per cent level under all model specifications for Melbourne. The *Christmas2000* explanatory variable is statistically significant at less than the 1 per cent level under the OLS specification for Adelaide. In regard to Sydney, while the *Christmas2000* explanatory variable is statistically significant at less than 1 per cent level using HAC standard errors, it is only statistically significant at the 5 per cent level using heteroscedasticity-robust standard errors and not statistically significant at the 5 per cent level under the GARCH(1,1) specification using quasi-maximum likelihood standard errors.

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[523] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 64.
[524] Australian Competition and Consumer Commission, *Reducing Fuel Price Variability*, p. 14.
[525] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 64.

These explanatory variables represent events when the normally observed retail price discounting cycle was muted or impaired to some extent.

In Melbourne, the coefficient on the *Blockade* explanatory variable suggests that the blockade of fuel terminal facilities which occurred in late September 2000 was associated with an average increase of around 3.7 cpl in the NIM during the period from the week beginning 25 September 2000 until the week beginning 9 October 2000.

In Adelaide, the coefficient on the *Christmas2000* explanatory variable was associated with an average increase in the NIM of around 3.6 cpl in the week beginning 11 December 2000 until the week beginning 18 December 2000. In Melbourne, the coefficient on the *Christmas2000* explanatory variable was associated with an average increase in the NIM of around 4.1 cpl to 4.7 cpl in the week beginning 11 December 2000 until the week beginning 1 January 2001. In Sydney, the coefficient on the *Christmas2000* explanatory variable was associated with an average increase in the NIM of around 3.0 cpl to 3.1 cpl in the week beginning 11 December 2000 until the week beginning 1 January 2001.

The *Blockade* and *Christmas2000* explanatory variables probably both represent periods of a negative supply shock, whereby wholesale petrol prices rose, flowing into higher retail petrol prices, in order to ration the unanticipated lower quantity of petrol available. In relation to *Blockade*, the level of the NIM probably remained high for a further two weeks after the blockade was lifted as

wholesale market participants sought to increase margins in order to recover and make up for the period of lost sales and revenue.

7.5 *Merger*, *Regulation*$_1$ and *Iraq*

The *Merger* explanatory variable in relation to all three cities is statistically significant at less than the 1 per cent level under all model specifications. The *Regulation*$_1$ explanatory variable in regard to Melbourne and the *Iraq* explanatory variable in regard to both Melbourne and Sydney are all statistically significant at less than the 1 per cent level under all model specifications. These explanatory variables also represent events when the normally observed retail price discounting cycle was muted or impaired to some degree.

In Adelaide, the coefficient on the *Merger* explanatory variable was associated with an average increase in the NIM of around 2.7 cpl in week beginning 20 March 2000 until the week beginning 27 March 2000. In Melbourne, the coefficient on the *Merger* explanatory variable was associated with an average increase in the NIM of around 2.6 cpl in week beginning 20 March 2000 until the week beginning 27 March 2000. In Sydney, the coefficient on the *Merger* explanatory variable was associated with an average increase in the NIM of around 2.9 cpl to 3.7 cpl in week beginning 13 March 2000 until the week beginning 3 April 2000.

In Melbourne, the coefficient on the *Regulation*$_1$ explanatory variable in the six month period from the week beginning 30 June 1997 until the week beginning

22 December 1997, was associated with the NIM that was around 2.7 cpl to 3.1 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and was around 1.1 cpl to 1.4 cpl higher than compared to the following seven month period from the week commencing 29 December 1997 until the week commencing 27 July 1998 during the period of wholesale petrol price regulation.

In Melbourne, the coefficient on the *Iraq* explanatory variable was associated with an average increase in the NIM of around 3.1 cpl to 3.3 cpl during the period from the week beginning 24 March 2003 until the week commencing 7 April 2003. In Sydney, the coefficient on the *Iraq* explanatory variable was associated with an average increase in the NIM of around 2.7 cpl to 3.8 cpl in the week beginning 17 March 2003 until the week beginning 14 April 2003.

Unlike the explanatory variables *Blockade* and *Christmas2000*, the explanatory variables *Merger*, $Regulation_1$ and *Iraq* do not appear to be associated with any reported negative supply shocks. One possible explanation is that the *Merger*, $Regulation_1$ and *Iraq* explanatory variables could represent periods when the normally observed competitive process of retail price discounting cycles broke down to some extent and gave way to more co-operative strategies and behaviour being adopted by market participants towards rival firms at the wholesale level. While these three episodes are still far removed from any serious attempt to set a wholesale monopoly profit maximising price through a tacitly collusive agreement, it does suggest that it is possible for sporadic periods of co-operation to break out between rival firms at the wholesale level

with the normally observed retail price discounting cycles in Adelaide, Melbourne and Sydney becoming either muted or failing to occur for a period.

7.6 *Coles*

For Melbourne, the *Coles* explanatory variable is statistically significant at less than the 1 per cent level under all model specifications. The coefficient on the *Coles* explanatory variable was associated with an average reduction in the NIM of around 2.7 cpl in the week beginning 7 July 2003 until the week beginning 11 August 2003.

The *Coles* explanatory variable probably represents a period when the normally observed retail price discounting cycle in Melbourne became even more intense over a period of several weeks. One possible explanation for this is that the period leading up to the introduction of the commercial alliance between Shell and Coles may have triggered a more intense round of price discounting behaviour by rival wholesalers as they sought to protect and preserve their wholesale market shares from encroachment from the discount petrol offering of the commercial alliance at the retail level. If this is indeed the case, then it demonstrates that wholesale market participants are capable of making strategic moves in response and in order to counter the previously announced initiatives of a rival firm.

7.7 Regulation and Deregulation of Wholesale Petrol Prices

For both Adelaide and Sydney, the explanatory variable *Regulation* is statistically significant at less than the 1 per cent level under all model

specifications. For Melbourne, the explanatory variable *Regulation*$_2$ is statistically significant at less than the 1 per cent level under all model specifications.

The *Regulation*$_1$ explanatory variable was previously considered above in section 7.5 and given that it records a period when the normally observed process of retail price discounting cycles was muted within Melbourne, it is arguably the case that the *Regulation*$_2$ explanatory variable is generally more representative of the impact upon the NIM associated with the regulation of wholesale petrol prices within Melbourne.

For Adelaide, the coefficient on the *Regulation* explanatory variable suggests that the regulation of wholesale petrol prices was associated with a NIM that was around 1.2 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation. For Melbourne, the coefficient on the *Regulation*$_2$ explanatory variable suggests that the regulation of wholesale petrol prices was associated with a NIM that was around 1.6 cpl to 1.7 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation. For Sydney, the coefficient on the *Regulation* explanatory variable suggests that the regulation of wholesale petrol prices was associated with a NIM that was around 2.4 cpl to 2.6 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation.

The average level of the NIM initially rose in both Adelaide and Melbourne while it remained relatively unchanged in Sydney in the aftermath of the removal of wholesale petrol price regulation in August 1998 until the end of 1998. For all three cities, the $Deregulation_J$ explanatory variable is statistically significant at less than the 1 per cent level under all model specifications. For Adelaide, the coefficient on the $Deregulation_J$ explanatory variable is associated with a NIM that is around 1.4 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and is around 0.2 cpl higher on average than compared to the previous period of wholesale petrol price regulation. For Melbourne, the coefficient on the $Deregulation_J$ explanatory variable is associated with a NIM that is around 2.2 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and is around 0.5 cpl to 0.6 cpl higher on average than compared to the previous seven month period during wholesale petrol price regulation. For Sydney, the coefficient on the $Deregulation_J$ explanatory variable is associated with a NIM that is around 2.5 to 2.6 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and is either the same or around 0.1 cpl higher on average than compared to the previous period of wholesale petrol price regulation.

While the average level of the NIM rose in the immediate aftermath of wholesale petrol price deregulation in Melbourne and Adelaide but remained relatively unchanged in Sydney, during the first half of 1999 the average level

of the NIM fell in Adelaide, Melbourne and Sydney and then fell even further again during the second half of 1999. The explanatory variable $Deregulation_2$, associated with the first six months of 1999, is statistically significant at less than the 1 per cent level for Melbourne and Sydney under all model specifications, while it is statistically significant at less than the 5 per cent level for Adelaide under the OLS specification.

For Adelaide, the coefficient on the $Deregulation_2$ explanatory variable is associated with a NIM that is around 0.7 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and around 0.5 cpl lower on average than during the period of wholesale petrol price regulation. For Melbourne, the coefficient on the $Deregulation_2$ explanatory variable is associated with a NIM that is around 1.1 cpl to 1.4 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation, and between 0.3 cpl to 0.5 cpl lower on average than compared to the final seven month period of wholesale petrol price regulation. For Sydney, the coefficient on the $Deregulation_2$ explanatory variable is associated with a NIM that is around 1.6 cpl higher on average than compared to the period from the beginning of July 1999 following wholesale petrol price deregulation and between 0.8 cpl to 1.0 cpl lower on average than during the period of wholesale petrol price regulation.

The eventual fall in the average level of the NIM following wholesale petrol price deregulation from the second half of 1999 was around 1.2 cpl on average

in Adelaide, between around 1.6 cpl to 1.7 cpl on average in Melbourne, and between around 2.4 cpl to 2.6 cpl on average in Sydney, than compared to the period of wholesale petrol price regulation.

The eventual fall in the average level of the NIM following the transition from wholesale petrol price regulation to deregulation lends itself to two possible explanations. The first explanation is that the reduction in the average level of the NIM was directly associated with the deregulation of wholesale petrol prices. A second alternative explanation is that there was some other structural change that occurred in the wholesale and/or possibly retail petrol markets in Adelaide, Melbourne, and Sydney that was responsible for the eventual reduction in the average level of the NIM.

There is one possible candidate in regard to Melbourne and Sydney for an alternative explanation for the fall in the average level of the NIM following deregulation. The ACCC opined in 1996 that petrol imports by independents were "likely to provide the domestic industry with greater international price discipline".[526] While higher levels of imports by independents may provide an alternative explanation for the eventual fall in the average level of the NIM following deregulation, it is unlikely to be the main reason. This is because there were already independent import terminals at Hastings (near Melbourne) and Sydney able to receive imported petrol from overseas prior to January 1997 so any impact on the average level of the NIM arising from independent

[526] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 57.

imports was arguably already present during the sample period for regulation. Furthermore, even if it was assumed that increased imports by independents was the major reason behind the eventual fall in average level of the NIM observed in Melbourne and Sydney following deregulation, it does not explain why the average level of the NIM also fell in Adelaide which did not possess an independent import terminal. In Adelaide, independent operators were completely dependent on the oil majors for their petrol supply.

Hence, the shortcoming with the second alternative explanation is the inability to identify any structural change that occurred simultaneously in the Adelaide, Melbourne, and Sydney wholesale and/or retail petrol markets during the course of 1998 and/or 1999. In the absence of any alternative explanation for the reduction in the average level of the NIM during the first half of 1999 in Adelaide, Melbourne, and Sydney, it is concluded that this change was most probably associated with the deregulation of wholesale petrol prices.

The coefficients on the dummy variables accounting for the impact of regulation on wholesale petrol prices in Adelaide, Melbourne and Sydney suggests that it resulted in relatively higher retail petrol prices than would have otherwise been the case in all three cities. One possible explanation for this is that the regulation of wholesale petrol prices increased the costs of production for petrol wholesalers, namely the oil majors, which was in turn passed on to retail customers in the form of relatively higher retail petrol prices. One obvious means through which production costs would have increased is through the regulatory compliance cost burden imposed. The regulatory compliance costs

incurred could have included the cost of hiring, training, and maintaining staff to meet the compliance burden, the purchase and maintenance of reporting and information technology systems, and obtaining advice from external sources (such as legal advice) to assist with the compliance requirements.[527]

There are several possible explanations for the rise in the level of the NIM in Melbourne, and to a lesser extent in Adelaide, immediately following the deregulation of wholesale petrol prices. In regard to Adelaide, the most obvious explanation, as outlined in Chapter 6, is that it was related to a fire that occurred at the Port Stanvac refinery on 2 August 1998 which was responsible for closing down the refinery for two months and which left petrol stocks in Adelaide low in the two months following the fire. Hence, the small rise in the average level of the NIM in Adelaide could be related to a negative supply side shock.

One possible reason for the rise in the average level of the NIM in both Melbourne and Adelaide could be due to a less intense retail price discounting cycle in Melbourne and Adelaide during the period from August 1998 until the end of December 1998 associated with negotiations between the two Melbourne refiners in Shell and Mobil towards establishing a refining joint venture. As was considered in section 7.5 above, it may be possible for sporadic periods of co-operation to break out between rival firms and replace the normally observed retail price discounting cycles. On 28 August 1998, Shell

[527] Regulation Taskforce (2006) *Rethinking Regulation: Report of the Taskforce on Reducing Regulatory Burdens on Business*. Report to the Prime Minister and the Treasurer, Canberra, January, p. 9.

and Mobil announced a proposal to form a joint venture of their refining assets to be jointly owned by the two companies. This could have lead to an impetus towards more co-operative behaviour between the two refiners in the wholesale market, thus leading to less intense wholesale market competition within Melbourne and Adelaide that ultimately flowed through into relatively higher retail prices and an increase in the average level of the NIM. The Shell and Mobil refinery joint venture was eventually abandoned in late January 1999.

Another possible explanation in regard to both Melbourne and Adelaide is that the removal of wholesale price controls could have prompted wholesale market participants to raise their margins with impunity as the controls that had previously operated in order to constrain their pricing behaviour had been rescinded. One potential shortcoming with this explanation is the extent to which the regulation of wholesale petrol prices acted as a serious constraint upon the conduct of wholesale market participants. As was observed in Chapter 6, capital city retail prices were more often than not below the regulated wholesale price level. This suggests that the regulation of wholesale petrol prices did not act as a serious constraint upon the pricing behaviour of wholesale market participants, and hence the removal of the regulation was unlikely to trigger a significant increase in the level of the NIM. In any event, the magnitude of the increases in the average level of the NIM recorded in Melbourne and Adelaide suggests that wholesale petrol prices would still have been well within the permissible limits allowed for by the wholesale petrol price regulation even if it had continued.

One possible explanation for the eventual fall in the average level of the NIM following the deregulation of wholesale petrol prices is that it reduced production costs which were eventually competed away by wholesale market participants during the first half 1999 and passed on to consumers in the form of relatively lower retail petrol prices. One means through which the deregulation of wholesale petrol prices may have reduced production costs is through the removal of regulatory compliance costs as considered above. In addition, it is possible that there could have been a reduction in production costs associated with dynamic efficiency gains resulting from innovation and rising levels of productivity.[528] The removal of regulation may have generated greater innovation and creativity as management attention was no longer diverted by the regulatory compliance obligations associated with wholesale petrol price regulation.

The pattern of an initial rise in the average level of the NIM in Melbourne and Adelaide followed by an eventual reduction in the average level of the NIM in Adelaide, Melbourne, and Sydney is suggestive of some sort of gradual adjustment process whereby wholesale market participants took time to adjust and learn how to behave in their new operating environment. In measuring the effects of regulatory changes, Joskow and Rose consider that it is ideal to use a fairly lengthy time series in order to avoid basing conclusions on possible

[528] Joskow, J. L. and Rose, N. L. (1989) The Effects of Economic Regulation. In Schmalensee, R. and Willig, R. D. (eds.) *Handbook of Industrial Organization*. Vol. II, Elsevier Science Publishers B. V., Amsterdam, 1449-1506, p. 1456.

transitional responses.[529] It needs to borne in mind that wholesale petrol prices had been regulated nationally by the Commonwealth Government since the early 1970s, and prior to this, had been subject to a *de facto* national regime of price regulation through the determinations of the South Australian prices commissioner since the 1950s.[530]

The eventual reduction in the average level of the NIM following the deregulation of wholesale petrol prices is suggestive that capital city wholesale petrol markets are competitive to some extent, if not immediately in the short term, then at the very least in the medium term, in that wholesale prices, as reflected through changes in relative retail petrol prices, eventually adjusted to changes in the cost structure at the wholesale level. If capital city wholesale petrol markets were not at least competitive in the medium term, then you would not expect to see the average level of the NIM fall following wholesale petrol price deregulation, with wholesale market participants, principally the oil majors in this case, simply pocketing any reduction in production costs associated with deregulation, as it would be irrational for them to do otherwise if they were participating in a tacitly collusive agreement given that petrol exhibits very strong price inelastic demand at the retail level.

The eventual reduction in the average level of the NIM in Adelaide, Melbourne, and Sydney following wholesale petrol price deregulation suggests that the Commonwealth Government's rationale for the removal of the regulation, in

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[529] *ibid.*, p. 1458.
[530] Royal Commission on Petroleum, *op.cit.*, p. 332.

that it had an adverse effect, thus leading to relatively higher retail petrol prices, may in fact have had substance. The lower average level of the NIM following wholesale petrol price deregulation suggests that motoring consumers in Adelaide, Melbourne, and Sydney enjoyed relatively lower retail petrol prices on average than would have otherwise been the case if wholesale petrol price regulation had continued and were unambiguously better off as a result. An important policy implication from this result is that it suggests that not only was the regulation of wholesale petrol prices an ineffectual policy instrument in terms of constraining the pricing behaviour of the oil majors in setting wholesale petrol prices, but that the regulation probably imposed increased production costs that were ultimately paid for by motoring consumers through relatively higher retail petrol prices.

These findings that the deregulation of wholesale petrol prices was associated with a relative reduction in retail petrol prices in Adelaide, Melbourne, and Sydney are at odds with the previous findings of Delpachitra and Beal who concluded that the deregulation of wholesale petrol prices had benefitted oil companies more than consumers and had not increased price competition.[531] One fundamental problem with the study conducted by Delpachitra and Beal is that the majority of the sample used to represent the period following wholesale petrol price deregulation, 3 January 1997 to 16 April 1999, was actually still within the period covered by the regulation of wholesale petrol prices. The regulation wasn't removed until 1 August 1998.

[531] Delpachitra, S. and Beal, D., *op.cit.*, p. 64.

7.8 Victorian Terminal Gate Pricing Legislation

The *TG* explanatory variable, associated with the period in Melbourne from August 2001 onwards when the Victorian Government's terminal gate pricing legislation came into effect, is statistically significant at less than the 1 per cent level under all model specifications.

The coefficient on the *TG* explanatory variable is associated with an increase in the NIM of between 1.6 cpl to 1.7 cpl on average. This result is consistent with the findings of a study by CAV that found that the NIM in Melbourne had risen by almost 1.5 cpl in the 14 month period from November 2001 following the introduction of the Victorian Government's terminal gate pricing legislation as compared to the previous 14 month period.[532] Similarly, the ACCC in examining the period between 1 July 2000 and 30 September 2002, found that in the period following the enactment of the Victorian terminal gate pricing legislation in August 2001, average retail petrol prices in Melbourne were 1.0 cpl higher in relation to the IPI.[533]

One possible explanation for the *TG* explanatory variable is that the Victorian Government's terminal gate pricing legislation resulted in increased production costs for designated petrol wholesalers under the legislation. One obvious source through which production costs could have increased is through regulatory compliance costs. The estimated rise in the average level of the NIM following the introduction of the terminal gate pricing legislation may be

[532] Consumer Affairs Victoria, *op.cit.*
[533] Australian Competition and Consumer Commission, *Terminal gate pricing arrangements in Australia*, p. 5.

attributable to increased production costs associated with the legislation being passed on to motoring consumers in the form of relatively higher retail petrol prices. There is some anecdotal evidence in support of this proposition.

According to the ACCC, some oil companies had commented to them that the terminal gate pricing legislation had imposed administrative costs upon them.[534] In 2004, Mobil opined that the terminal gate pricing legislation had imposed "a number of conditions upon the petroleum products market that restrict the competitive operation of the market".[535] In particular, Mobil complained that the terminal gate pricing legislation specifies a formula that must be used by all declared suppliers and "inhibits suppliers from developing innovative forms of wholesale pricing".[536] In 2006 Caltex opined that the Victorian terminal gate pricing legislation had added to administrative costs.[537]

On the other hand, both the ACCC and CAV identified other factors that could have been responsible for the rise in the average level of the NIM following the enactment of the Victorian terminal gate pricing legislation. While the ACCC had observed that relative retail petrol prices had risen since the Victorian terminal gate pricing legislation had come into effect, it was unable to "conclude with certainty" that this increase could be attributed to the legislated

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[534] *ibid.*, p. 4.
[535] ExxonMobil Australia Pty Ltd (2004) *Submission to the Productivity Commission Inquiry into National Competition Policy.* Melbourne.
[536] *ibid.*
[537] Caltex Australia Limited (2005) *Caltex submission to Queensland Parliament: Impact of Petrol Pricing Select Committee.* Sydney, p. 17.

terminal gate pricing arrangements.[538] The ACCC nominated the exit of Liberty from the retail market in Melbourne and the cessation of REAs as other factors that may have contributed to the rise in the relative retail price of petrol following the introduction of the Victorian terminal gate pricing legislation. Given the impact arising from the termination of REAs has been explicitly accounted for in the modelling for this study, this matter will be considered in the following section.

CAV observed that the rise in the average level of the NIM in Melbourne coinciding with the terminal gate pricing legislation was also associated with an increase in the average level of NIM in other mainland capital cities, namely Brisbane, Perth, Adelaide and Sydney. CAV insinuated that the increase in the average level of the NIM in Melbourne was associated with some wider structural problem in regard to mainland capital cities across the nation and called on the ACCC to investigate the increase in the average level of the NIM across the mainland capital cities.

Comparisons of the average level of the NIM between Melbourne as compared to Adelaide, Brisbane and Perth are arguably misplaced because of restrictive fuel specifications operating in South Australia, Queensland, and Western Australia, that probably raised barriers to entry to wholesale petrol markets in those states thus leading to higher relative wholesale and retail petrol prices, whereas there were no restrictive fuel specifications operating in Victoria at that

[538] Australian Competition and Consumer Commission, *Terminal gate pricing arrangements in Australia*, p. 5.

time. It has been acknowledged in several quarters that restrictive fuel specifications have been responsible for delivering a *price premium* to local refiners in several Australian states. Therefore, any comparison between the Melbourne wholesale petrol market as compared to the Adelaide, Brisbane and Perth wholesale petrol markets is arguably invalid on the basis that *like* is not being compared with *like*. Even CAV acknowledged this point to some extent in that it attributed part of the increase in the average level of the NIM that occurred in Perth to a product premium that was progressively introduced by local Perth refiner BP in response to progressive changes to fuel specifications operating in Western Australia.[539]

Arguably, the only valid capital city wholesale petrol market with which to compare Melbourne to was Sydney. This is because like Melbourne and Victoria, there were no restrictive fuel specifications operating in regard to Sydney and New South Wales.

It was decided to test whether there was a similar impact on the average level of the NIM in Sydney coinciding with the introduction of the Victorian terminal gate pricing legislation in order to determine whether there is any evidence in support of the proposition that there was some wider structural change affecting other mainland capital cities in the same way as had been observed in relation to Melbourne. This was performed through re-estimating a regression for the NIM in Sydney with the intervention variable, *TG*, as had previously been used in relation to Melbourne. The results of this test are reported in Appendix 9 as

[539] Consumer Affairs Victoria, *op.cit.*, p. 58.

equations A9.1 and A9.2. The test results show that there is no statistically significant effect on the average level of the NIM in Sydney coinciding with the introduction of the Victorian terminal pricing legislation. On this basis, claims of there being some wider structural change occurring in mainland capital cities responsible for raising the average level of the NIM in Melbourne would appear to be without substance.

Another possible explanation for the rise in the average level of the NIM which coincided with the enactment of the Victorian Government's terminal gate pricing legislation suggested by the ACCC was the exit of retail market participant Liberty through the leasing of its retail service station site network to Woolworths. This presumably would be on the basis of a reduction in the level of competition and price discounting in the Melbourne retail petrol market.

As Liberty was also a participant in the Sydney retail petrol market as well as the Melbourne retail market, and assuming that Liberty adopted a similar retailing strategy in Sydney as it did in Melbourne, then any impact on the average level of the NIM in Sydney associated with the withdrawal of Liberty from the Sydney retail petrol market would presumably have also shown up in the test performed for identifying structural change in Sydney coinciding with the introduction of the Victorian terminal gate pricing legislation reported in equations A9.1 and A9.2. As there was no statistically significant effect observed, the proposition that the increase observed in the average level of the

NIM in Melbourne is associated with the exit of Liberty from petrol retailing would also appear to be without substance.

It would thus appear that the rise in the average level of the NIM following the enactment of the Victorian terminal gate pricing legislation was attributable to the enactment of the legislation. This suggests that motoring consumers in Melbourne may have paid around 1.6 cpl to 1.7 cpl relatively more on average in retail petrol prices for the mandating of transparent wholesale petrol pricing arrangements in Victoria, leaving Melbourne motoring consumers unambiguously worse off.

It is interesting to note that the estimated average impact of the Victorian Government's terminal gate pricing legislation on the NIM in Melbourne is very similar in magnitude to the estimated average impact on the NIM arising from wholesale petrol price regulation in Melbourne (during normal retail price discounting cycles). Given the regulatory intervention imposed through the Victorian Government's terminal gate pricing legislation is similar in nature to that previously imposed through the regulation of wholesale petrol prices, it should probably come as little surprise that the estimated impact of these two regulatory interventions should be similar on the average level of the NIM and upon relative retail petrol prices in Melbourne.

This finding is consistent with the view put forward by the Industry Commission in 1994 that the effect of terminal gate pricing implemented

through regulation "would be to re-instate price regulation, but at the terminal gate rather than the wholesale level".[540]

7.9 Impact from the Termination of REAs in Melbourne and Sydney

For Melbourne and Sydney, the *exREAs* explanatory variable is statistically significant at less than the 1 per cent level under all model specifications.

The coefficient on the *exREAs* explanatory variable for Melbourne, is associated with an increase in the NIM of around 1.5 cpl to 1.6 cpl on average following the period in which REAs were terminated as compared to the previous 11 month period during the operation of the Victorian Government's terminal gate pricing legislation. The coefficient on the *exREAs* explanatory variable for Sydney, is associated with an increase in the NIM of around 2.1 cpl on average following the period in which REAs were terminated as compared to previous three year period. Hence, the termination of REAs in Melbourne and Sydney coincided with an increase in the average level of the NIM.

The increase in the average level of the NIM in Melbourne associated with the termination of REAs was marginally smaller than the increase in the NIM associated with the enactment of the Victorian Government's terminal gate pricing legislation and the increase in the NIM associated with wholesale petrol price regulation under the OLS specification (during normal retail price discounting cycles) while about the same under the ARCH specification. The increase in the average level of the NIM in Sydney associated with the

[540] Industry Commission, *op.cit.*, p. XXVIII.

termination of REAs was around 0.3 to 0.5 cpl smaller in magnitude than the increase in the NIM associated with wholesale petrol price regulation.

There are two possible explanations for the rise in the average level of the NIM recorded in both Melbourne and Sydney. The first explanation is that the rise in the average level of the NIM arises as a consequence of the termination of REAs in both Melbourne and Sydney. The second explanation is that there was some other structural change that occurred in the wholesale and/or possibly retail petrol markets in Melbourne and Sydney from mid-2002 coinciding with the termination of REAs that was responsible for the rise in the average level of the NIM. The shortcoming with the second explanation is the inability to identify any alternative source of structural change that occurred simultaneously in the Melbourne and Sydney wholesale and/or retail petrol markets from mid-2002. In the absence of any alternative explanation for the rise in the average level of the NIM from mid-2002 in Melbourne and Sydney, it is concluded that this change was most likely brought about through the termination of REAs.

The fact that the average level of the NIM rose following the termination of REAs would appear to refute concerns in relation to both Melbourne and Sydney that REAs were associated with attempts by market participants to engage in tacit collusion with the objective of raising prices in order to reap monopoly profits. The concerns expressed by Walker and Woodward that REAs served as a device to achieve a tacitly collusive outcome would appear to be ill-conceived based on these results for Melbourne and Sydney.

The results for Melbourne and Sydney instead provide support for the proposition that REAs were unlikely to have been associated with an anti-competitive detriment in situations where the wholesale petrol markets are relatively contestable to imported sources of petrol by independents. Both Melbourne and Sydney possessed independent import terminal facilities through which independent operators did source imported petrol for wholesaling and retailing purposes.

One possible interpretation of these results is that the increase in the average level of the NIM could be associated with an increase in transportation costs incurred by refiners following the breakdown in REAs, resulting from refiners reverting to transporting petrol from their own refineries to service wholesale and retail markets rather than sourcing product from local refiners. However, as REAs were largely replaced by buy-sell arrangements between refiners, it is unlikely that there would have been any significant increase in transportation costs incurred following the termination of REAs.

As there was no apparent cost increase incurred in the chain of production associated with the termination of REAs to explain the increase in the average level of the NIM observed in Sydney and Melbourne, another possible explanation is that the abandonment of REAs resulted in an increase in transaction costs. This is consistent with those who have taken a transaction cost approach to explain reciprocity, whereby reciprocity facilitates the construction of optimal production facilities through mitigating against the potential for post-contractual opportunistic behaviour. Rose has suggested that

the transaction cost savings generated through the use of REAs include the cost of discovering the relevant market prices, negotiating, and enforcing contracts.[541]

The lower average level of the NIM recorded during the period for which REAs were in operation suggests that REAs had a pro-competitive effect on Melbourne and Sydney wholesale petrol markets that flowed into relatively lower retail petrol prices. Hence, it appears that motoring consumers enjoyed relatively lower retail petrol prices than would have otherwise been the case and were unambiguously better off as a consequence of REAs.[542] These results in relation to Melbourne and Sydney would also suggest that the ACCC's previously expressed concerns that REAs had exclusionary effects that could result in an anti-competitive detriment were erroneous at least in these instances.

7.10 Impact from the Termination of REAs in Adelaide

For Adelaide, the *exREAs* explanatory variable is statistically significant at less than the 1 per cent level under the OLS model specification.

The coefficient on the *exREAs* explanatory variable for Adelaide is associated with a decrease in the NIM of almost 1.0 cpl on average following the period in which REAs were terminated as compared to the previous six month period.

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[541] Rose, J., *op.cit.*, pp. 80-81.

[542] It is estimated that the benefit of REAs to motoring consumers of unleaded petrol in Melbourne and Sydney combined was around $100 million in the last 12 months that REAs were in operation. This estimate assumes the petrol consumption of motoring consumers in Melbourne is approximately equal to motoring consumers in the rest of Victoria, and that the petrol consumption of motoring consumers in Sydney is approximately equal to motoring consumers in the rest of New South Wales (including the Australian Capital Territory).

Unlike the case with Melbourne and Sydney, the termination of REAs in Adelaide coincided with a decrease in the average level of the NIM.

The decrease in the average level of the NIM in Adelaide associated with the termination of REAs was around 0.2 cpl smaller in magnitude than the increase associated with wholesale petrol price regulation.

There are two possible explanations for the fall in the average level of the NIM recorded in Adelaide. The first explanation is that the fall in the average level of the NIM arises as a direct consequence of the termination of REAs. The second explanation is that there was some other structural change that occurred in the wholesale and/or possibly retail petrol markets in Adelaide from the beginning of 2000 coinciding with the termination of REAs that was responsible for the fall in the average level of the NIM. The shortcoming with the second explanation is the inability to identify any alternative structural change that occurred in regard to Adelaide from the beginning of 2000. In the absence of any alternative explanation for the fall in the average level of the NIM from the beginning of 2000, it is concluded that this change was most likely associated with the termination of REAs.

The fall in the average level of the NIM in Adelaide following the abandonment of REAs is arguably a perverse result in that it runs counter to the increased supply costs that would most probably have been incurred by all four oil majors operating within the Adelaide wholesale petrol market.

Mobil would have incurred increased supply costs from its refinery production process at Port Stanvac flowing from the loss of economies of scale following the decision of both Shell and BP to source product from outside of Adelaide, resulting in Mobil cutting back production at the Port Stanvac refinery to a reported 60 per cent of capacity. Presumably Caltex, who continued to source petrol from Mobil in Adelaide, was most likely charged some sort of premium above the previous price it incurred under the refinery exchange agreement system which was essentially its own cost of production. With the decision by BP and Shell to reject Mobil's revised refinery exchange agreement offer in regard to the Port Stanvac refinery, BP and Shell would have incurred increased supply costs through shipping product from refineries at Kwinana in Western Australia and from Geelong in Victoria instead of receiving product at their own cost of supply under the refinery exchange agreement system. In addition, all four oil majors would have also lost some or all of the applicable transaction cost savings generated through the use of REAs, such as those identified by Rose.[543]

Mitigating against the increased petrol supply costs incurred by Mobil arising from the termination of REAs for the Port Stanvac refinery was possible financial assistance from the South Australian Government. Financial assistance from the South Australian Government may have been provided but never made public. It was reported that the South Australian Government was working on an assistance package for the Port Stanvac refinery during late 1999

[543] J. Rose, *op.cit.*, pp. 80-81.

and early 2000.[544] The Industry Commission reported in 1996 that the South Australian Government regarded details of selective assistance it provided to firms as *commercial-in-confidence* and that significant sanctions applied to any politician or official who publicly revealed *commercial-in-confidence* information about assistance packages provided to specific firms by the South Australian Government.[545] It is possible that Mobil could have been a recipient and beneficiary of such discrete industry assistance payments from the South Australian Government.

Conversely, there is unlikely to have been any mitigating factors offsetting the likely higher petrol supply costs incurred by Caltex, BP and Shell following the termination of the previous refinery exchange agreement system.

The perverse result that the average level of the NIM actually fell in Adelaide following the termination of REAs, even though petrol supply costs for all four oil majors would most probably have risen, is suggestive of some sort of strategic response on the part of one or more oil major following the termination of the previous refinery exchange agreement system in regard to Adelaide, as may have been the case with the *Coles* explanatory variable in regard to Melbourne. If the fall in the average level of the NIM was due to some sort of strategic response on the part of one or more oil major in the

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[544] *The Advertiser* (1999) Stanvac rates 'a done deal'. 23 December: 32; *The Advertiser* (2000) Stanvac refinery rates slashed. 4 March: 8.
[545] Industry Commission (1996) *State, Territory and Local Government Assistance to Industry.* AGPS, Melbourne, Report No.55, p. 334.

Adelaide wholesale petrol market, then it is important to try to identify the most likely explanation for the nature of any such strategic response.

One possible explanation for the likely nature of the strategic response is the rationale behind the alternative hypothesis, H_2, in that the decrease in the average level of the NIM in Adelaide following the termination of the refinery exchange agreement system could provide evidence that REAs were associated with an anti-competitive detriment that resulted in relatively higher wholesale and retail petrol prices. This would have been the case in the event that the previous refinery exchange agreement system, as it operated in regard to the Adelaide wholesale petrol market, provided the means through which the oil majors were able to arrive at a tacitly collusive agreement. Given the ability for a home refiner to capacity constrain other parties under a refinery exchange agreement, any such tacitly collusive agreement would most likely have been struck on the basis of a market sharing arrangement. In this case, the reduction in the average level of the NIM could thus be interpreted as a breakdown in any such tacitly collusive agreement struck between the oil majors and a reversion to a competitive pricing stratagem at the wholesale level. This scenario is consistent with the view expressed by Walker and Woodward that REAs "facilitate output co-ordination between the [oil] majors".[546]

Unlike Melbourne and Sydney, the Adelaide wholesale petrol market exhibited an important structural characteristic which was identified in Chapter 5 as being a necessary pre-condition for REAs to have an anti-competitive effect in that it

[546] Walker, J. and Woodward, L., *op.cit.*, p. 34.

was closed off and impervious to petrol imports by independents. The Adelaide wholesale petrol market was not contestable to independent imports of petrol due to the absence of an independent import terminal in Adelaide and was only accessible to petrol imports by the oil majors who each possessed import terminal facilities.

If the operation of REAs had facilitated the means to achieve a tacitly collusive outcome, then the modelling of the NIM for Adelaide suggests that the level of market power exercised through the operation of REAs was of the order of around 1.0 cpl on average. However, the proposition that the fall in the average level of the NIM for Adelaide provides evidence that REAs resulted in some sort of anti-competitive detriment within the Adelaide wholesale petrol market appears to be implausible. As previously outlined, the retail demand for petrol is price inelastic at any recent price level, suggesting that retail petrol prices, and by implication wholesale petrol prices, are far removed from a profit-maximising monopoly price that would be the ultimate goal and objective of any tacitly collusive oligopoly. On this basis, the fall in the average level of the NIM for Adelaide being associated with some kind of anti-competitive detriment through the operation of REAs is therefore rejected. This opens up the search for another possible explanation for the likely nature of the strategic response.

Another possible explanation for the likely nature of the strategic response is that Mobil sought to *punish* the other oil majors, in particular BP and Shell, for rejecting their revised refinery exchange agreement offer in regard to the Port

Stanvac refinery and terminating the agreements. This explanation also appears to be implausible for a number of reasons. As the operator of the only refinery near Adelaide, Mobil arguably had to incur the greatest financial burden and penalty of any of the four oil majors arising from the breakdown of REAs in regard to the Port Stanvac refinery through the loss of economies of scale in the oil refining process. Indeed, Mobil had sought to renegotiate the REAs in regard to the Port Stanvac refinery in order to generate additional revenue from the other participating oil majors. It is extremely unlikely that Mobil would have sought to exacerbate the increased costs of production incurred through the loss of economies of scale in oil refining through the termination of REAs with BP and Shell still further with a deliberate strategy of reducing its wholesale petrol prices, and by implication the average level of the NIM. Rather than pursuing a policy to lower its wholesale petrol prices and thereby reduce the average level of the NIM in Adelaide, Mobil was most probably the main policy advocate behind the decision by the South Australian Government to introduce new restrictive fuel specifications for the state which most likely had the effect of increasing the average level of the NIM for Adelaide as well as forcing Shell to seek petrol supplies from Mobil in Adelaide once more.

A further explanation is that one or some combination of the other oil majors in Caltex, BP and/or Shell embarked on a deliberate strategy of reducing wholesale petrol prices that in turn brought down the average level of the NIM in Adelaide. There could have been several motivating factors behind such a move.

One or more of the oil majors other than Mobil may have sought to lower wholesale petrol prices in order to increase market share in the Adelaide wholesale petrol market at the expense of rivals. One or more of the oil majors other than Mobil may have attempted to *punish* Mobil for attempting unsuccessfully to renegotiate the REAs in regard to the Port Stanvac refinery and sought to apply pressure on Mobil's profitability through reducing wholesale petrol prices in order to persuade Mobil to return to the previous refinery exchange agreement arrangements.

In addition, one or more of the oil majors other than Mobil may have reduced wholesale petrol prices in Adelaide in order to increase pressure on the profitability and future viability of the Port Stanvac refinery in an attempt to force its closure. Conduct of this nature could arguably border on predation. There had been a question mark surrounding the commercial viability of the Port Stanvac refinery since the mid-1980s and it was widely considered to be the most likely candidate for closure amongst Australia's major oil refineries.[547] The Port Stanvac refinery was arguably the most primitive of Australia's major oil refineries in that it was the only one not to possess a catalytic cracking capacity and had been subject to persistent speculation regarding its imminent closure since 1999 and was eventually mothballed in 2003. The removal of the only local refiner near Adelaide in Mobil may have given the other three oil majors the opportunity to increase their wholesale markets share in Adelaide, as well as South Australia, at the expense of Mobil. The closure of the Port

[547] See: *Australian Financial Review* (1985) BP Begins Closure of Plant at Westernport. 31 January: 9.

Stanvac refinery would also probably result in increased production opportunities for other Australian oil refineries. In order to make up for any product shortfall in Adelaide and across South Australia, the oil majors other than Mobil could expand production at their Australian refineries, thereby lowering production costs through increased economies of scale associated with a higher throughput, thus improving the financial viability of other Australian refineries.

The lower average level of the NIM recorded during the period after which REAs were terminated is arguably a perverse result given that it probably occurred while increased petrol supply costs were most probably incurred by all four oil majors participating in the Adelaide wholesale petrol market. While this could superficially be taken as evidence that REAs were associated with some kind of anti-competitive detriment in the Adelaide wholesale petrol market ultimately resulting in relatively higher retail petrol prices to motoring consumers, such a conclusion appears implausible. This is because there was presumably scope to generate far greater profits than an average price premium of around 1.0 cpl if REAs had indeed served as a mechanism to achieve a tacitly collusive agreement given the price inelastic nature of petrol at the retail level. This perverse result is suggestive of some kind of strategic response on the part of one or more of the oil majors following the termination of the previous refinery exchange agreement system in relation to Adelaide.

7.11 Conclusion

While wholesale petrol markets in Adelaide, Melbourne, and Sydney are oligopolistic in nature and may be prone to sporadic outbursts of co-operation between rival firms, they are also arguably competitive in that profits from reductions in production costs appear to be gradually competed away and eventually passed through to motoring consumers in the form of relatively lower retail prices. Against this backdrop, it is extremely improbable that REAs would be associated with any anti-competitive detriment.

Indeed, results for Melbourne and Sydney suggest that REAs actually lowered the costs of petrol supply, the benefits of which were eventually passed through to motoring consumers in the form of relatively lower retail prices as evidenced by the rise in the average level of the NIM following the termination of REAs. Under these circumstances, it would appear that REAs were unambiguously pro-competitive and ultimately of benefit to motoring consumers.

On the other hand, results for Adelaide suggest that REAs were actually associated with relatively higher wholesale and retail petrol prices given the fall in the average level of the NIM following the termination of REAs. This result for Adelaide would appear to be perverse given that petrol supply costs for all four oil majors operating in Adelaide most probably increased. While this could be interpreted as evidence of some kind of anti-competitive detriment associated with the operation of REAs in the Adelaide wholesale petrol market, it is far more likely to represent some kind of strategic response on the part of one or more of the oil majors following the termination of REAs. This is

because there would appear to have been far greater scope to increase the average level of the NIM through the operation of REAs than the 1.0 cpl suggested through the modelling of the Adelaide NIM if REAs had indeed served as a means through which to achieve a tacitly collusive outcome given the highly price inelastic nature of petrol at the retail level.

While the operation of REAs appears to have had a pro-competitive effect on wholesale petrol markets in Melbourne and Sydney by delivering relatively lower retail petrol prices to motoring consumers and unlikely to have been associated with any anti-competitive detriment in the Adelaide wholesale petrol market, it appears that regulatory interventions by governments in wholesale petrol markets do in fact tend to be associated with relatively higher retail petrol prices for motoring consumers given the estimated impact on the average level of the NIM following wholesale petrol price deregulation and the enactment of the Victorian terminal gate pricing legislation.

The implications for the conduct of public policy arising from these findings will be considered in Chapter 8.

Chapter 8: Conclusion

8.1 Introduction

This Chapter will draw out the main implications for the conduct of public policy arising from the findings contained in Chapter 7. It will make policy recommendations on the suitability of further regulatory interventions in capital city wholesale petrol markets based on findings in relation to competition and the exercise of market power in those markets. It will also consider the policy implications for competition law and policy arising from the competitive effects of reciprocity as practiced through REAs. Further, it will consider the policy implications of the conduct of the ACCC in its consideration of REAs. Finally, it will summarise the main policy findings as well as make a policy recommendation in the event the downstream petroleum industry seeks to re-institute REAs in the future.

8.2 Competition, Market Power and Regulatory Intervention

The finding from Chapter 7 that capital city wholesale petrol markets are competitive to some extent, if not immediately in the short-term, then at the very least in the medium term, throws up several implications for these markets. In particular, it suggests that firms operating in these markets are unable to exercise market power on a sustainable or prolonged basis.

Given that retail demand for petrol is highly price inelastic, thus making it beneficial and profitable for wholesale market participants to engage in tacit price collusion, fluctuations in retail petrol prices coupled with fluctuations in

the NIM suggest the exercise of market power by the oil majors in capital city wholesale petrol markets is generally fleeting and transitory in nature and immediately undermined by any price discounting behaviour. The exercise of market power within capital city wholesale petrol markets appears to have only persisted during those instances where the normal retail petrol price cycles have become muted or impaired to some extent through a diminution of price discounting behaviour, which has been found to be very much an exceptional event. There were probably four cases of this that were explicitly accounted for in the modelling for this study: the first occurring in the Melbourne retail petrol market during the second half of 1997; the second occurring in Melbourne (and less likely in Adelaide) from August 1998 until the end of 1998 in the immediate aftermath of wholesale petrol price deregulation; a third occurring across all three cities in March 2000 while Caltex and Shell were engaged in discussions concerning a joint venture of their refinery operations; and a fourth occurring in both Melbourne and Sydney during the period of the 2003 Iraq war.

As observed in Chapter 7, this conduct is still far removed from any serious attempt to set a monopoly profit maximising price through a tacitly collusive agreement. Vigorous competition on the basis of price discounting within wholesale petrol markets that manifests itself through regular price cycles at the retail level would appear to be the normal course of events. The only exceptions to this appear to be some rare intermittent periods when market participants

probably decide to temporarily abandon price competition at the wholesale level in favour of co-operation for a period of time.

The finding that any market power exercised by the oil majors is transitory within capital city wholesale petrol markets is in marked contrast to the views of the ACCC which opined in 1996 that the oil majors possessed significant market power.[548] According to the ACCC, this power was derived from high concentration levels, high barriers to entry, and the depth and breadth of vertical and horizontal relationships between the market participants.[549] It could arguably be the case that the ACCC misinterpreted the ability of the oil majors (in concert with other wholesale market participants) to co-operate briefly by co-ordinating their activity through the curtailment of the retail price discounting cycle by raising wholesale prices, which ultimately manifests itself through the ratcheting up of retail petrol prices within a short space of time, with the ongoing exercise of market power on a sustained basis. At the time the ACCC made these remarks, it was still engaged in litigation against three of the four oil majors (Mobil, Shell and BP) for alleged price fixing in Melbourne and Sydney.

On the other hand, the conclusion reached here that the oil majors appear only to have been able to exercise market power on a transitory basis is much more in keeping with the views of the Industry Commission and Rose. The Industry Commission concluded in 1994, with some limited qualifications in relation to

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[548] Australian Competition and Consumer Commission, ACCC recommends end to petrol declaration.
[549] *ibid.*

small country towns, "the petroleum product markets have a structure conducive to vigorous competition and not consistent with the persistence of monopoly power".[550] Rose contended the ACCC was in error when it concluded the oil majors exercised co-ordinated market power, which he attributed to its misunderstanding of the competitive implications of REAs.[551]

The inability of the oil majors to exercise market power on a prolonged basis leads to several policy implications. First and foremost, it is that competition within capital city wholesale petrol markets is arguably the best discipline and market regulator of wholesale petrol prices. While petrol is highly price inelastic at an aggregate level within retail markets, individual brands of petrol are probably also highly price elastic due to the opportunities for competitive substitution between competing brands. The consequence of this is that wholesalers, and the retailers they supply, cannot afford to relax on a particular price level and are unable to completely ignore the price discounting behaviour of competitors if they want to at least retain business or even attract additional business.

In the second instance, the inability to exercise market power on a prolonged or sustainable basis in capital city wholesale petrol markets suggests the case for regulatory intervention on competition grounds, in so far as it has related to keeping retail petrol prices relatively low, has generally been weak. Regulatory interventions based on competition grounds through the setting of maximum

[550] Industry Commission, *Petroleum Products*, p. 61.
[551] Rose, J., The ACCC and the Market Power of the Oil Majors – Part 1, pp. 17-18.

allowable wholesale petrol prices, as well as mandated transparency of terminal gate petrol prices, have arguably been a policy failure because they have been associated with relatively higher retail petrol prices. Rather than promote competition through protecting the community from some sort of anti-competitive detriment, it appears these regulatory interventions may in fact have had the diametrically opposite effect in that they were associated with relatively higher retail petrol prices than would have otherwise been the case. These regulatory interventions have probably resulted in a pass-through of regulatory compliance costs from wholesalers on to retailers who in turn have passed it on to motoring consumers without delivering any measurable or identifiable benefit.

It would thus appear that previous regulatory interventions in capital city wholesale petrol markets, based on competition grounds, have been ill-conceived, without necessarily addressing any clearly identified competition problem. This suggests future regulatory interventions on competition grounds in capital city wholesale petrol markets should be avoided in the absence of some sort of clearly identified and defined anti-competitive detriment. Even if an anti-competitive problem can be identified, any regulatory intervention directed towards addressing it should be subject to a cost-benefit analysis as to its likely impact so as to ensure the costs imposed through regulatory intervention are not greater than the competition problem it is supposed to be addressing. In the absence of any cost-benefit analysis, there is the prospect and danger that any future regulatory intervention runs the risk of imposing a far

greater regulatory compliance cost burden, that would probably be passed through to retailers and ultimately on to motoring consumers in the form of relatively higher retail petrol prices, as to outweigh the amount of anti-competitive detriment of the originally perceived problem.

The finding that capital city wholesale petrol markets are competitive to some extent, if not immediately in the short-term, then at the very least in the medium term, probably runs very much contrary to public opinion, which is arguably riddled with strongly held preconceived notions that wholesale and retail petrol markets are highly anti-competitive. The high level of public scepticism regarding the competitiveness of capital city wholesale and retail petrol markets creates a policy environment conducive for ill-conceived regulatory interventions based on populist grounds. This at the very least suggests that regulatory interventions based on competition grounds within wholesale and retail petrol markets should be treated with extreme caution and carefully considered, in order to avoid creating a situation where the cure is far worse than the disease. Arguably, governments at both the Commonwealth and state levels should resist future regulatory interventions in capital city wholesale petrol markets on competition grounds if they are genuinely concerned about keeping the level of retail petrol prices relatively low for motoring consumers, unless there is a clearly identifiable competition problem leading to a deterioration in the level of competition that can in fact be rectified.

However, it appears that policy positions providing for further regulatory intervention within capital city wholesale petrol markets, that have previously

been associated with relatively higher capital city retail petrol prices, are being recycled by both the Commonwealth Government and the Federal Opposition.

Similar to the Victorian terminal gate pricing legislation which was associated with relatively higher retail petrol prices in Melbourne, the Commonwealth Government has implemented a national terminal gate pricing regime mandating price transparency at the terminal gate throughout Australia as part of the new Oilcode code of conduct for the downstream petroleum industry that came into effect on 1 March 2007. There is the possibility that a national terminal gate pricing regime could impose regulatory compliance costs on suppliers that could end up being passed on to motoring consumers in the form of relatively higher retail petrol prices, as was probably the case with the Victorian terminal gate pricing legislation. Although this could be mitigated to an extent if the Commonwealth Treasury is correct in its contention that the Commonwealth Government terminal gate pricing arrangements are not as prescriptive as the provisions operating in Victoria.[552]

Similar to the previous system of prices surveillance that regulated wholesale petrol prices and was associated with relatively higher retail petrol prices across all three capital cities considered, the Federal Opposition is proposing to reinstitute some form of prices surveillance under the TPA in the event it is elected to government after the next federal election. As was probably the situation with the previous system of prices surveillance that regulated wholesale petrol prices, there is a danger that any new price monitoring system

[552] Commonwealth Treasury, *op.cit.*, p. 18.

for wholesale petrol prices could impose regulatory compliance costs on wholesalers that could ultimately be passed on to motoring consumers in the form of relatively higher retail petrol prices.

In conclusion, the available evidence suggests the invisible hand of the market place proposed by Adam Smith[553] has arguably been a far more effective means of organising economic activity within capital city wholesale petrol markets than the visible hand of government through regulatory intervention which has been associated with relatively higher retail petrol prices. The general inability of wholesale market participants to exercise market power on a sustainable or prolonged basis has probably meant government attempts to intervene in capital city wholesale petrol markets has resulted in a pass-through of regulatory compliance costs on to motoring consumers without providing any identifiable nor offsetting benefit whatsoever, particularly in the presence of inelastic demand. Therefore, in the absence of any clearly defined and identifiable anti-competitive detriment, governments at the Commonwealth and the state level should probably resist the urge *to do something* by engaging in further regulatory interventions in capital city wholesale petrol markets of the kind previously adopted or used.

8.3 Reciprocity and Implications for Competition Law

As previously outlined, REAs are an example of a voluntary reciprocal trading arrangement. In Chapter 4, it was seen that views were mixed as to the

[553] See: Smith, A. (1999) *An Inquiry into the Nature and Causes of the Wealth of Nations*. Penguin Books, London, Vol. 4, ch. 2, p. 32.

competitive effects of reciprocity with three main positions being postulated: reciprocity is always anti-competitive; reciprocity is anti-competitive under certain circumstances; and the practice of reciprocity is either benign or even pro-competitive in its effect. In regard to voluntary reciprocity, Allison contended that this could result in an anti-competitive detriment when both firms were relative equals in the possession of market power.[554]

In Chapter 7, it was concluded that REAs were unlikely to have been associated with any anti-competitive detriment in any of the three capital city wholesale petrol markets under consideration. On this basis, it would appear that those who have contended that reciprocity always results in an anti-competitive detriment are probably in error. Furthermore, in relation to Melbourne and Sydney, the reciprocity as practiced through REAs likely served a pro-competitive purpose by lowering the cost of petrol supply which was probably eventually passed on to motoring consumers in the form of relatively lower retail petrol prices. The results for Melbourne and Sydney appear to provide support for the reservations expressed by the Chicago school that reciprocity could result in an anti-competitive detriment. Instead, reciprocity appears to have served a pro-competitive purpose in these instances and delivered a benefit to consumers resulting in relatively lower retail prices than would have otherwise been the case.

Stocking and Mueller as well as Areeda, Hovenkamp and Elhauge have previously raised concerns that reciprocity when practiced amongst rival firms

[554] Allison, J. R., *op.cit.*

could facilitate collusive conduct.[555] Given the reciprocity as exhibited in REAs has been found to be either probably benign at least in its effect on competition in regard to the Adelaide wholesale petrol market and even pro-competitive in regard to its effects on the Melbourne and Sydney wholesale petrol markets, this may allay concerns reciprocity, even when practiced between market rivals, may necessarily lead to co-operation and collusive outcomes that could in turn stifle the competitive process.

In Chapter 4, it was contended that reciprocity would only be likely to raise concerns regarding anti-competitive conduct and detriment in the presence and exercise of market power, while it was argued that reciprocity would be unlikely to be associated with any anti-competitive detriment in the absence of market power. One possible explanation as to why this voluntary form of reciprocity as practiced through REAs does not appear to be associated with any anti-competitive detriment may be related to the inability of market participants to exercise market power in capital city wholesale petrol markets on a sustainable or prolonged basis.

If the reciprocity of REAs did not provide the means by which to facilitate a tacitly collusive agreement, then presumably it must have provided some other tangible benefit to participants, otherwise the oil majors probably would not have chosen to engage in such arrangements. One potential source of tangible benefits delivered by participation in the reciprocal trading arrangements

[555] Stocking, G. W. and Mueller, W. F., *op.cit*; Areeda, P. E., Hovenkamp, H. and Elhauge, E., *op.cit*.

engendered through REAs is from possible transaction cost savings, as proposed by Williamson. The transaction cost rationale to explain reciprocal trading arrangements, in that reciprocity allows for the construction of optimal production facilities while mitigating against the prospect of post-contractual opportunistic behaviour, would appear to hold merit in relation to the operation of REAs at least in regard to Melbourne and Sydney, as suggested by the rise in relative retail petrol prices and the NIM following termination of the agreements. It is also possible REAs delivered transaction cost savings to participants in regard to Adelaide, but the quantification of any evidence in support of this was hindered through the possible strategic response by one or more of the oil majors following the termination of REAs in relation to the Port Stanvac refinery as discussed in Chapter 7.

One of the objections raised to reciprocity on competition grounds was that it foreclosed markets on competitors who were not suitably diverse in their range of activities. This objection to reciprocity is similar to one of the ACCC's main objections to REAs, which had interpreted the conduct of the oil majors in refusing to enter into similar supply swap arrangements with independents as they had with other refiners, as possible evidence for the anti-competitive exclusionary intent of REAs, with the supply of product to independents being either constrained or cut off altogether as a consequence. It would appear that the oil majors may have possessed a legitimate reason to exclude independents from their reciprocal trading arrangements through REAs provided by the transaction cost rationale for reciprocity. While reciprocal trading arrangements

between refiners through REAs may have generated transaction cost savings to the oil majors, on the other hand, product swap agreements between oil majors and independents could not generate similar transaction cost savings.

The fact independents could not provide a like-for-like service in a fuel swap arrangement with the oil majors as compared to the REAs amongst the oil majors was explicitly recognised by the ACCC when the then Chairman of the ACCC, Professor Allan Fels, wrote in 1998 that:

> The oil majors have not generally entered refinery exchange agreements with independent operators because the independent operators cannot reciprocate in the kind of services that the majors offer.[556]

Presumably the full significance and implications following on from the inability of independents to fully reciprocate on the full service offered by the oil majors through participation in REAs and the associated transaction cost savings achieved was not fully comprehended nor appreciated by the ACCC. The oil majors may not have assisted their cause in the policy debate surrounding the competitive merits of REAs by their failure to refer to the potential transaction cost savings generated through reciprocity in these instances, although the oil majors were not alone in either ignoring or being oblivious to the transaction cost saving rationale for reciprocity, as both the ACCC and the Industry Commission also failed to consider it at least publicly.

A major policy implication is that reciprocal trading arrangements, even when practiced between market rivals, can deliver pro-competitive benefits and

[556] Fels, A., Competition Not Regulation is in Consumers' Best Interests, p. 19.

should definitely be allowed to proceed under these circumstances. Reciprocal trading arrangements within Australia, even between market rivals, has been made possible due to the flexibility that exists within the structure of Australia's competition law as set out under the TPA. While certain horizontal agreements between market rivals to fix, maintain and control prices, as well as those containing exclusionary provisions, are subject to a *per se* prohibition under the TPA, section 45 of the TPA only prohibits other horizontal agreements between market rivals if they fail a competition test which is that they have the purpose or would have or be likely to have the effect of substantially lessening competition.

If reciprocal trading arrangements between market rivals had been made subject to a *per se* prohibition under the TPA, then the benefits that were probably delivered to the oil majors and eventually passed on to motoring consumers in the form of relatively lower retail petrol prices from REAs would never have been generated. This finding would appear to vindicate the position taken by the 1993 Hilmer report into National Competition Policy which considered the policy question as to whether all horizontal agreements between markets rivals should be subject to a *per se* prohibition.[557] The Hilmer report rejected this proposal on the grounds that a *per se* prohibition on all agreements between competitors would catch much economically efficient conduct.[558] It would appear the concerns expressed by the Hilmer report have turned out to be correct as they relate to REAs. Furthermore, it thus appears the design of the

[557] Hilmer, F. G., Rayner, M. R. and Taperell, G. Q., *op.cit.*, p. 48.
[558] *ibid.*, p. 48.

TPA in relation to agreements between competitors has served the community well in relation to the reciprocity as practiced through REAs.

Reciprocity should preferably be allowed to continue unfettered in circumstances where market power cannot be exercised on any sustainable or prolonged basis as it is likey to be benign at worst, and therefore unlikely to be associated with any anti-competitive detriment under these circumstances.

8.4 Implications for Competition Law Enforcement

The ACCC, and its predecessor body the TPC, had queried the legality of REAs as well as other horizontal arrangements (such as joint terminalling and borrow and loan) under the TPA on several occasions from the mid 1990s to 2000. The TPC had listed REAs as the first feature giving rise to concerns about the competitive nature of the downstream petroleum industry in 1995 in relation to the proposed merger between Ampol and Caltex.[559] The TPC went on to list the other horizontal arrangements such as joint terminalling as the second feature giving rise to competition concerns.[560]

Two then employees of the ACCC in Walker and Woodward asserted in March 1996 that REAs, along with joint terminalling and borrow and loan arrangements, were essentially a means through which the oil majors could reach a tacitly collusive agreement and provided a mechanism through which to

[559] Trade Practices Commission, *op.cit.*
[560] *ibid.*

enforce discipline amongst the oil majors from any attempts to deviate from a tacitly collusive agreement.[561]

Similarly, the ACCC suggested in 1996 that REAs could result in exclusionary effects resulting in an anti-competitive detriment. The ACCC inferred that the oil majors should seek authorisation for participation in REAs as well as for participation in other horizontal agreements. According to the ACCC:

> there is a need to be satisfied that [horizontal agreements] do not contravene the TPA and, on balance, do have net public benefits.[562]

The ACCC was arguably inferring there was a *prima facie* case against REAs as well as the other horizontal agreements for a possible breach of the TPA. In 1996, the ACCC made its consent for the deregulation of wholesale petrol prices conditional on its concerns regarding the competitive effects of REAs, in addition to other horizontal arrangements, being addressed.

In 1998, the then Chairman of the ACCC, Professor Allan Fels, hinted motoring consumers would probably benefit from more competition with the flow-on effect of relatively lower petrol prices in the event of the elimination of REAs altogether:

> Competition would be likely to increase, with the overall benefit to consumers that this would be likely to bring, with the removal of these

[561] Walker, J. and Woodward, L., *op.cit.*, p. 34.
[562] Australian Competition and Consumer Commission, *Inquiry into the Petroleum Products Declaration*, Vol. 1, p. 31.

> refinery exchange agreements, although further analysis of this issue could be required.[563]

Again in 2000, the then Chairman of the ACCC, Professor Fels, reiterated previous concerns regarding the operation of REAs, as well as other horizontal agreements, in testimony before a Senate Committee:

> Although there are some efficiency benefits involved in these arrangements, we are still concerned that they may facilitate co-ordinated behaviour between the refiners and marketers.[564]

Based on the inference of quantitative modelling assessing the competitive impact arising from the termination of REAs undertaken for this study, it appears that the ACCC's concerns regarding the possible exclusionary effects of REAs, resulting in an anti-competitive detriment, were probably misplaced and in error. Rather than providing the means by which to engage in co-ordinated conduct, thus leading to a tacitly collusive outcome, it is far more likely that REAs delivered transaction cost savings to oil major participants that were eventually passed on to motoring consumers in the form of relatively lower retail petrol prices at least in Melbourne and Sydney. Similar benefits arising from the operation of REAs in Adelaide may have also been observed if there were not possibly other strategic considerations and gamesmanship on the part of one or more oil major being exhibited.

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[563]. Fels, A., Competition Not Regulation is in Consumers' Best Interests, p. 19.
[564] Senate Economics Committee (2000) *Hansard.* Inquiry into the Provisions of the Fair Prices and Better Access for All (Petroleum) Bill 1999 and the Practice of Multi-Site Franchising by Oil Companies, 12 April, Canberra, p. E 214.

Based on the public statements by the ACCC, arguably the ACCC's preferred outcome may have been for the deregulation of wholesale petrol prices to occur in concert with the elimination of REAs. If the ACCC had managed to achieve this outcome, then the modelling from this study suggests that the benefits received by motoring consumers in Melbourne and Sydney from relatively lower retail petrol prices would have been marginal at best, possibly even bordering on a zero-sum game. While on a superficial level, a similar outcome achieved in the Adelaide retail petrol market would have been associated with relatively lower retail petrol prices, the observed quantitative impact arising from the termination of REAs in Adelaide has previously been discounted due to an apparent strategic response on the part of one or more of the oil majors.

Just as it appears the ACCC may have erred in its suggestion that REAs may have resulted in an anti-competitive detriment, it may have also erred in its suggestion that other horizontal agreements give rise to an anti-competitive detriment. Given the interpretation of the modelling from this study, it appears the oil majors may have been completely justified in their actions to resist the pressure applied by the ACCC to seek authorisation for their horizontal agreements, including REAs.

While the ACCC looked upon REAs and other horizontal arrangements with suspicion that they were possibly a facilitating device for tacit collusion, another government agency in the Industry Commission concluded in 1994 that REAs and borrow and loan operated in a way that reduced costs and was to the

advantage of petroleum product users.[565] Unlike the ACCC, the Industry Commission recommended the deregulation of wholesale petrol prices with no conditions attached whatsoever. Based on the modelling conducted for this exercise, this would have represented the optimal policy response for keeping capital city retail petrol prices relatively low.

It is probably a useful thing for governments to have access to a range of differing and alternative views when deliberating on the course of public policy. In the case of REAs, it certainly appears that the Industry Commission was much closer to the mark than was the ACCC. The Industry Commission arguably came to the task of assessing the downstream petroleum industry much closer to a state of *tabula rasa*, as opposed to the ACCC which likely brought with it some strongly held pre-conceived ideas in its role as both a price regulator of the industry as well as a competition law enforcer that had engaged in numerous litigious actions against participants within the industry over a number of years and was therefore less favourably predisposed to consider the industry in an impartial and dispassionate manner. The Commonwealth Government would have been better served, in this case, by listening to the views of the Industry Commission, rather than the ACCC, in relation to both wholesale petrol price deregulation and REAs.

The ACCC insinuated and inferred the oil majors were engaging in tacit collusion facilitated through REAs as well as through other horizontal

[565] Industry Commission, *Petroleum Products*, p. 63.

agreements over the course of several years. This conduct on the part of the competition regulator raises several issues.

In the first place, if the ACCC was indeed of the view that REAs had served the purpose of a facilitating device by the oil majors to engage in tacit collusion, then it did possess the necessary means at its disposal to test its opinion before a court of law for a possible breach of the TPA. The ACCC could have tested its inference regarding the anti-competitive effects of REAs under section 45 of the TPA, which prohibits contracts, arrangements, or understandings between market rivals subject to a competition test that they have the purpose or would have or be likely to have the effect, of substantially lessening competition. If the ACCC had possessed the courage of its persistent inferences over the course of several years then it should have initiated proceedings against the oil majors for a possible breach of section 45 of the TPA.

Probably the more appropriate course of action for the ACCC to have taken would have been to investigate REAs and launch legal action afterwards, if necessary, rather than continue to infer and insinuate that they were a facilitating device for tacit collusion over several years. Indeed, after its report on the downstream petroleum industry in 1996, the ACCC commented that by 1997 it would have had the chance to investigate REAs, thus allowing for wholesale petrol prices to be deregulated:

> the ACCC will have an opportunity by then to examine arrangements within the industry which give rise to some current concerns about anti-

> competitive effects, eg refinery exchange, borrow and loan, and joint terminalling arrangements...[566]

It would appear not much ever came from any follow-up inquiries by the ACCC on the competitive effects of REAs due to be completed by 1997, as the ACCC continued to infer and insinuate about the anti-competitive effects of REAs for several more years to come.

The 2003 Dawson report on the TPA considered complaints "the ACCC released information and made comments to the media that was neither balanced nor impartial and carried with it the danger that the corporation or individual involved might be denied procedural fairness in proceedings yet to be determined", conduct that has been labeled as trial by media.[567] Rowe from the Australian Chamber of Commerce and Industry summed up the concerns of business in regard to possible trial by media by the ACCC when he commented:

> the ACCC does have considerable powers to regulate industry and it should use those powers responsibly. But it should not go about seeking to damage company's reputations on the basis of allegations and our concern is that too often we see publicity given to these cases before the companies have had a chance to respond to the allegations, before we've seen the outcome in court and before we know whether the facts are right or wrong.[568]

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[566] Australian Competition and Consumer Commission, ACCC recommends end to petrol declaration.
[567] Dawson, D., Segal, J. and Rendall, C., *op.cit.*, p. 182.
[568] Lateline (1999) Fels faces foe. ABC Television, 9 May.

Similarly, all four oil majors made submissions to the 2002 TPA Review Committee outlining their concerns regarding the ACCC engaging in trial by media. According to Shell:

> in Shell's experience, the Commission is cavalier in its use of the media at the beginning of investigations, before any charges have been brought (let alone breaches found), while becoming quite "camera shy" when investigations lead nowhere or charges are not sustained. The Commission's behaviour demonstrates a lack of understanding, disinterest or, at worst, disregard for the serious business and reputational damage to particular companies or industries that can be caused by such use of the media.
>
> Shell also submits that, whilst this may be well received in the tabloid press, it is poor public administration, and not appropriate conduct for a regulatory agency.[569]

In response to accusations the ACCC was engaging in trial by media in 2002, the then Chairman of the ACCC, Professor Fels, repudiated such claims commenting that "there is no basis for this".[570] Further, he went on to deflect criticism from the oil majors, claiming that they were entirely to blame for their own poor public image:

> If oil companies have a bad reputation with the public, this not the fault of the ACCC. It is the fault of the oil companies.[571]

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[569] The Shell Company of Australia Limited (2002) *Submission to the Commission of Inquiry into the Trade Practices Act 1974*. Melbourne, pp. 8-9.
[570] Fels, A., *The Review of the Trade Practices Act and issues concerning the ACCC and the media.*
[571] *ibid.*

After the release of the Dawson report in 2003, Professor Fels went on to claim "hardly any of the ACCC publicity relates to matters that have not already been to trial and settled" and suggested that if the ACCC had in fact engaged in trial by media over the years, then there would have been court reprimands.[572]

It would appear that claims of trial by media waged against the oil majors in relation to REAs and other horizontal arrangements by the ACCC over a number of years are not without foundation, given the ACCC made numerous and arguably erroneous claims regarding such arrangements over the course of several years without ever testing any of these claims before a court of law. As outlined in Chapter 5, while the ACCC recognised by 2002 that REAs may have been a contributing factor to relatively lower retail petrol prices, and therefore by implication, may not have been associated with any anti-competitive detriment, it was also arguably deficient in failing to acknowledge that its previous claims in regard to REAs may have been wrong. Given continuous and erroneous insinuations and inferences over several years that the oil majors could be engaging in tacit collusion through REAs and other horizontal arrangements, it is probably disingenuous of the ACCC to absolve itself entirely of any culpability in relation to the poor public standing of the oil majors. Given the ACCC's public comments in regard to REAs over a number of years, the conclusions of the Dawson report that the ACCC "needs to exercise care in publicising individual matters to ensure that there is no

[572] Fels, A. (2003) *Competition Policy: A Report Card for the last 12 years and an Agenda for the Future*. Speech to the National Press Club, Canberra, 30 June.

unfairness to the parties involved" would appear to be entirely justified in the case of REAs.[573]

The Dawson report went on to recommend that the ACCC should develop a media code of conduct in consultation with interested parties to govern its use of the media, particularly in relation to enforcement proceedings.[574] Probably one matter which the Dawson report overlooked in arriving at its recommendations was the continual public airing of suspicions by the ACCC over several years of possible anti-competitive conduct without the instigation of court proceedings, which was the case in regard to REAs. If the ACCC is not going to investigate nor instigate court proceedings against certain conduct, then natural justice at the very least dictates that the ACCC should refrain from public comment in regard to the competitive merits of such conduct. In the absence of any investigation, nor the commencement of court proceedings, then an ACCC media code of conduct should be extended to include refraining from public comment on suspicions of anti-competitive conduct.

8.5 Conclusions

Capital city wholesale petrol markets, despite being oligopolistic in nature, are probably competitive as a result of the demonstrated inability of market participants to exercise market power on a prolonged or sustainable basis. The implications of this finding is that not only were various regulatory interventions doomed to failure because there was no apparent competition

[573] Dawson, D., Segal, J. and Rendall, C. *op.cit.*, p. 189.
[574] *ibid.*, p. 189.

problem that needed to be rectified, but that horizontal agreements between the oil majors, particularly REAs, were highly unlikely to serve as a facilitating device for tacit collusion under these circumstances.

In regard to the enforcement of competition law, public policy is probably best served by having the competition law enforcement authority investigate potential breaches of the law rather than conduct a running public commentary over the course of several years regarding its suspicions. It could be argued that the ACCC publicly maligned the oil majors over the course of several years based on its suspicions that REAs were anti-competitive, when in fact its suspicions were most probably wrong. The oil majors did have grounds for a legitimate grievance against the ACCC given its public comments over a period of several years. Under these circumstances, it may have been prudent and preferable for the ACCC to have refrained from public comment altogether in regard to REAs.

Rather than providing the means to engage in tacit collusion, REAs have been found to be benign at worst, but far more likely to be pro-competitive and efficiency enhancing, thereby leading to relatively lower retail petrol prices than would have otherwise been the case. On this basis, it would appear public policy is best served, provided wholesale capital city petrol markets remain relatively competitive, to encourage the re-institution of REAs between the oil majors operating within Australia.

Appendix 1: Australian Unleaded Petrol Demand

A1.1 Introduction

This Appendix will outline the data and process used to estimate a demand function for unleaded petrol in Australia. From this demand function, the short-run and long-run price and income elasticity of demand for unleaded petrol have been estimated.

A1.2 Model

Petrol demand functions have usually been estimated as a function of both the real price of petrol and real income. Dahl and Sterner contend that petrol demand functions that do not include some form of price and income measures in the model are mis-specified.[575]

The model specification used is dynamic and is known as the lagged endogenous model where the amount of unleaded petrol demanded in period t (D_t), is a function of the real price of unleaded petrol in period t (P_t), real income in period t (Y_t) and the amount of unleaded petrol demanded in the previous period. The model is outlined in equation A1.1 below:

$$D_t = f_{lagged\ endogenous}(P_t, Y_t, D_{t-i}) \qquad \text{(A1.1)}$$

Assuming log-linearity provides the following lagged endogenous model for estimation purposes, which is equation A1.2 below:

$$D_t = \beta_0 + \beta_1 P_t + \beta_2 Y_t + \beta_3 D_{t-1} + \varepsilon_t \qquad \text{(A1.2)}$$

[575] Dahl, C. and Sterner, T. (1991) Analysing gasoline demand elasticities: a survey. *Energy Economics* 13, 203-210, p. 204.

where the log of unleaded petrol demand is a function of the log of the real price of petrol, the log of real income, and the log of the quantity of unleaded petrol demanded during the previous period and ε_t is the assumed random error term. According to Dahl and Sterner, the inclusion of a lagged dependent variable in the model tends to improve the statistical fit of petrol demand functions considerably.[576]

A feature of the lagged endogenous model is that the coefficients β_1 and β_2 can be interpreted as the short-run price elasticity of demand and the short-run income elasticity of demand respectively, while β_1 divided by $(1 - \beta_3)$ and β_2 divided by $(1 - \beta_3)$ can be interpreted as the long-run price elasticity of demand and the long-run income elasticity of demand respectively.

A1.3 Data

Monthly time series data has been collected and constructed from May 1998 until September 2006. Monthly data on real income in per capita terms has been constructed from a combination of quarterly national accounts data[577] and quarterly demographic statistics[578] published by the Australian Bureau of Statistics (ABS).

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[576] *ibid.*, p. 204.
[577] Australian Bureau of Statistics (2007) *Australian National Accounts: National Income, Expenditure, and Product, December 2006.* Cat. no. 5206.0, Canberra. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5206.0Dec%202006?OpenDocument [Accessed 11 March 2007]
[578] Australian Bureau of Statistics (2007) *Australian Demographic Statistics, September 2006.* Cat no. 3101.0, Canberra. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Sep%202006?OpenDocument [Accessed 30 March 2007]

Estimates for monthly real gross domestic income (in 2004-05 dollars) have been calculated using a smoothing equation to evenly distribute quarterly real gross domestic income across each of the three months in each quarter (see equations A1.3.1-3 for example).

$$Month_{t-2} = Month_{t-3} + \frac{\left(\frac{Quarter_t}{3} - Month_{t-3}\right)}{2} \qquad \text{(A1.3.1)}$$

$$Month_{t-1} = Month_{t-2} + \frac{\left(\frac{Quarter_t}{3} - Month_{t-3}\right)}{2} \qquad \text{(A1.3.2)}$$

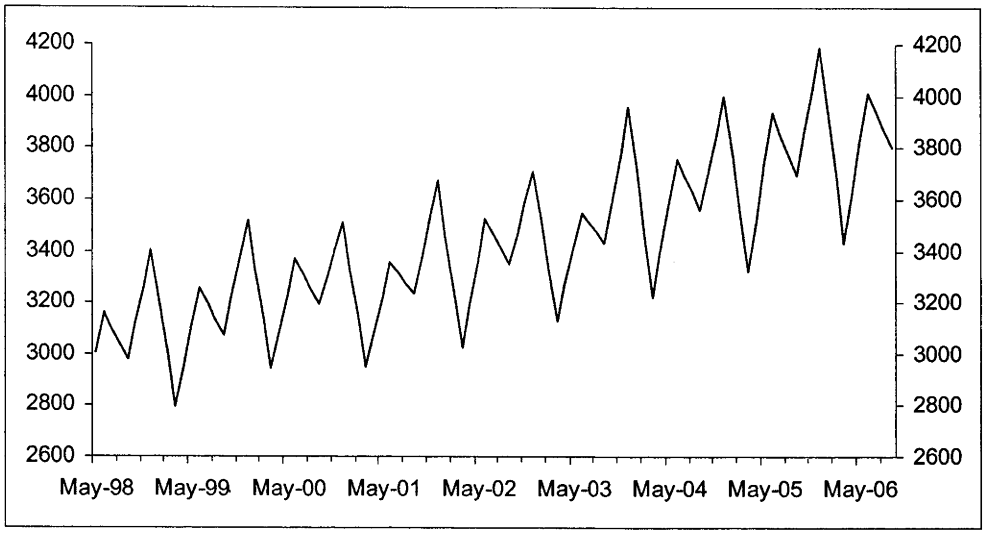
$$Month_t = Month_{t-1} + \frac{\left(\frac{Quarter_t}{3} - Month_{t-3}\right)}{2} \qquad \text{(A1.3.3)}$$

Monthly estimates of real gross domestic income have been divided by monthly estimates of the Australian resident population in order to produce monthly estimates of real income in per capita terms (in 2004-05 dollars).

Quarterly estimates of Australia's resident population have been converted into monthly estimates by evenly distributing quarterly growth in the population between the three months of each quarter.

Monthly estimates of real per capita income is shown below in Chart 7.

Chart 7: Monthly Real Per Capita Income in 2004-05 Dollars

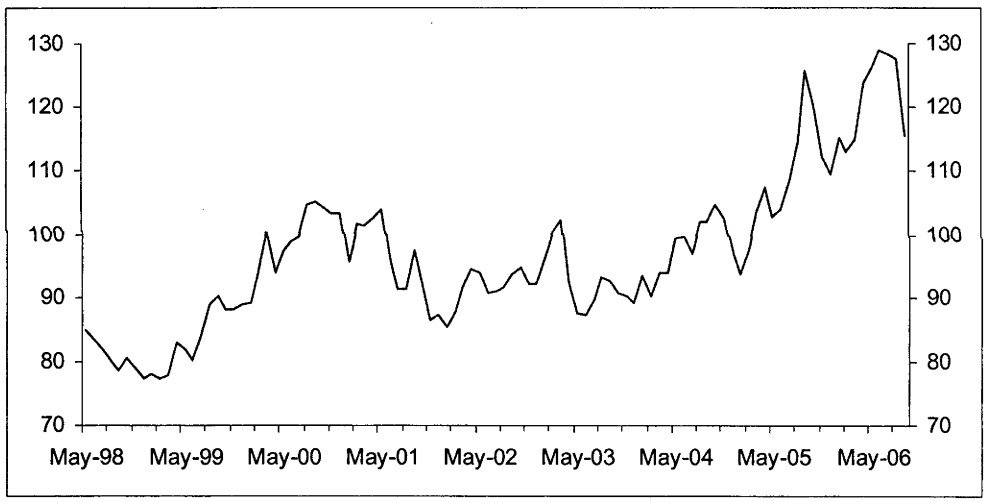


Monthly current price data for unleaded petrol has been sourced from the Australian Automobile Association which publishes price data for capital cities and major country towns that runs from May 1998 to the present.[579] An average current price for unleaded petrol in Australia has been constructed by taking a weighted average of capital city prices using the same weights as used by the ABS in the construction of 15th series of the consumer prices index (CPI).[580] The average current price for unleaded petrol in Australia has been converted into a real or constant price series (in 2004-05 dollars) by deflating it by a monthly price index series derived from the CPI.[581] Quarterly index numbers from the CPI have been taken as the assumed index number for the middle month of the quarter and the two months in between have been assumed to

[579] Australian Automobile Association. Issues for Motorists: Petrol Prices. http://www.aaa.asn.au/issues/petrol.htm [Accessed 6 September 2006]
[580] Australian Bureau of Statistics (2005) *Information Paper: Introduction of the 15th Series Australian Consumer Price Index 2005 (Reissue)*. Cat. no. 6462.0, Canberra.
[581] Australian Bureau of Statistics (2007) *Consumer Price Index, Australia, December 2006.* Cat. no. 6401.0, Canberra. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Dec%202006?OpenDocument [Accessed 11 March 2007]

follow a trend. The only exception to this has been in relation to the September quarter 2000 covering the period of the introduction of the goods and services tax (GST), whereby the increase that occurred in the month of August 2000 was assumed to follow the same trend as occurred between the middle months of the March 2000 and June 2000 quarters, with the remainder and bulk of the increase in the index assumed to occur in July 2000 coinciding with the introduction of the GST. The estimated average Australian monthly retail price for unleaded petrol in real terms is provided below in Chart 8.

Chart 8: Average Australian Monthly Retail Price for Unleaded Petrol in 2004-05 Dollars (in cents per litre)

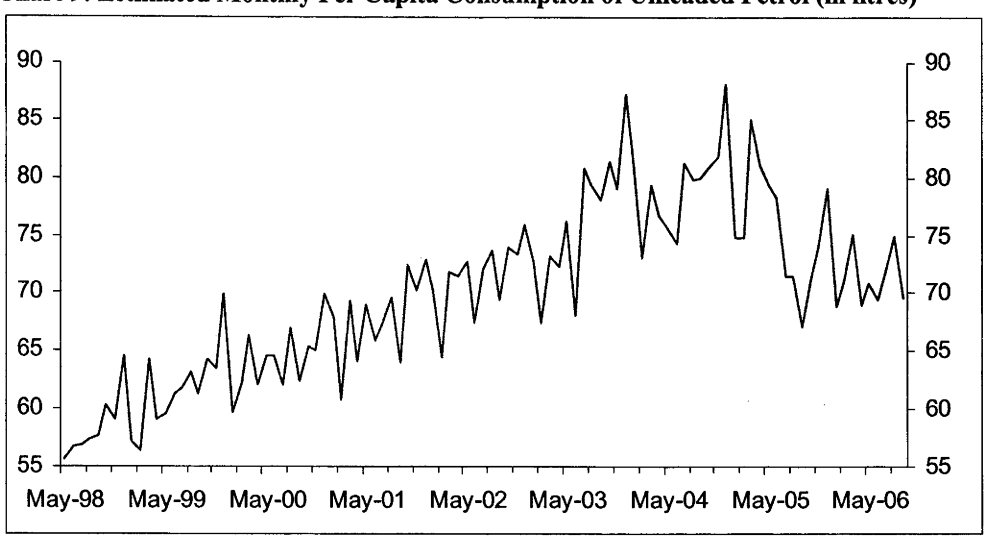


In the estimation of average Australian monthly retail prices for unleaded petrol in real terms, no allowance has been made for the price differential that usually exists between city and country retail petrol prices. Country petrol prices are generally higher than city petrol prices. However, the estimated real prices will still provide a reasonable approximation for two primary reasons. First, capital cities have generally accounted for in excess 60 per cent of registrations for

unleaded petrol motor vehicles, suggesting that the bulk of unleaded petrol is consumed within the capital cities.[582] Second, average movements in country unleaded petrol prices generally follow average movements in city unleaded petrol prices over time as is demonstrated in chart 3 in section 2.7.4.

Monthly data on the volume of unleaded petrol sold in Australia has been sourced from various monthly editions of *Australian Petroleum Statistics* published by the Commonwealth Government Department of Industry, Tourism and Resources. The volume of unleaded petrol consumed on a per capita monthly basis was estimated using the monthly data on the volume of unleaded petrol sold in Australia and dividing it by the estimated monthly Australian resident population. The derived monthly per capita consumption of unleaded petrol is provided below in Chart 9.

Chart 9: Estimated Monthly Per Capita Consumption of Unleaded Petrol (in litres)



[582] Australian Bureau of Statistics (2003) *Motor Vehicle Census: 31 March 2003*. Cat. no. 9309.0, Canberra.

A1.4 Stationarity

Graham and Glaister have highlighted that several studies have expressed concern over the previous lack of recognition of the nonstationary nature of variables used in estimating petrol demand functions.[583] The stationarity properties of the three variables under consideration, the log of the volume of unleaded petrol consumed on a monthly per capita basis, the log of monthly real income on a per capita basis, and the log of an average monthly real price for unleaded petrol across Australia, were tested using the Phillips-Perron (PP) test. [584]

The PP test was performed using two specifications: the first with the inclusion of a constant term; and second with a constant as well as a linear trend term. Table 23 below presents the results.

[583] Graham, D. J. and Glaister, S. (2002) The Demand for Automobile Fuel. *Journal of Transport Economics and Policy* 36, 1-26, p. 17.

[584] The PP test was preferred to the Augmented Dickey-Fuller (ADF) test because of the high number of lags that had to be used to control for autocorrelation in the D_t and Y_t terms, thus compromising the reliability of the ADF test. The ADF test controls for higher-order serial correlation by adding lagged difference terms of the dependent variable. The PP test uses a nonparametric method to control for higher-order autocorrelation.

Table 23: Augmented Dickey-Fuller Test for UPD_t, Y_t, and P_t

Variable	PP test with constant	PP test with constant and trend
D_t	-3.0994* (0.0298)	-6.5130# (0.000)
ΔD_t	-30.4264# (0.0001)	-
Y_t	-3.0047* (0.0378)	-3.9950* (0.0118)
ΔY_t	-7.9269# (0.0000)	-7.8450# (0.000)
P_t	-1.3168* (0.6194)	-2.5652* (0.2970)
ΔP_t	-8.7694# (0.0000)	-8.6744# (0.0000)

Note: Figures in brackets are the corresponding probabilities.
* indicates that the null hypothesis of a unit root has been accepted at the 1 per cent level.
# indicates that the null hypothesis of a unit root has been rejected.

The test for P_t shows that the null hypothesis for the presence of a unit root is accepted, while for ΔP_t the alternative hypothesis of a stationary time series is accepted. On this basis, it is concluded that P_t is integrated in the first order or I(1).

The results for D_t and Y_t are less certain. While for Y_t the null hypothesis for the presence of a unit root is accepted at 1 per cent, it is not accepted at 5 per cent. As an additional test, Y_t was tested using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test.[585] The results of the KPSS test for Y_t are presented below in table 24.

[585] The KPSS test performs the test that a series is stationary as the null hypothesis against the alternative hypothesis for the presence of a unit root.

Table 24: KPSS Test for Y_t

Variable	KPSS test with constant	KPSS test with constant and trend
Y_t	1.2970#	0.3849#
ΔY_t	0.0803*	0.0777*

* indicates that the null hypothesis of stationarity has been accepted.
# indicates that the null hypothesis of stationarity has been rejected at the 1 per cent level.

The KPSS test rejects the null hypothesis that Y_t is stationary at the 1 per cent level, while it accepts the null hypothesis that ΔY_t is stationary. On the basis of the KPSS test, it is concluded that Y_t is I(1).

In the case of D_t the PP test with a constant accepts the presence of a unit root at the 1 per cent level, but not at the 5 per cent level. On the other hand, the PP test with both a constant and linear trend term for D_t accepts the alternative hypothesis that the series is stationary. In choosing between which specification of the PP test to accept as the best representation for D_t, it was decided to resort to the Akaike Information Criterion (AIC) and the Schwarz Criterion (SC), with smaller values being preferred. On basis of the AIC and SC, it was found that the PP test with just the constant term was the preferred specification.

As an additional test, D_t was also tested using the KPSS test with the constant specification. The results of the KPSS test for D_t are presented below in table 25.

Table 25: KPSS Test for D_t

Variable	KPSS test with constant
D_t	1.0363#
ΔD_t	0.3314*

* indicates that the null hypothesis of stationarity has been accepted.
# indicates that the null hypothesis of stationarity has been rejected at the 1 per cent level.

The KPSS test rejects the null hypothesis that D_t is stationary at the 1 per cent level, while it accepts the null hypothesis that ΔD_t is stationary. On the basis of the KPSS test, it is concluded that D_t is I(1).[586]

Estimates of relationships between nonstationary variables could lead to spurious regression by suggesting significant relationships between wholly unrelated variables.[587] Granger and Newbold proposed a simple test to identify potential spurious regression where an R-squared or adjusted R-squared was coupled with an extremely low value for the Durbin-Watson statistic.

A standard approach for addressing the problem of nonstationary data has been to specify models as relationships between differences.[588] However, the major drawback from this approach is that a model based solely on difference terms can only capture the short-run dynamics in a process and therefore fails to identify any long-run relationships between the variables.

While D_t, Y_t *and* P_t are non-stationary, given that all three variables are non-stationary of the same order I(1), it is possible that the linear combination of these three variables could in fact be stationary. Granger coined the term cointegration to describe a stationary combination of nonstationary variables.[589]

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[586] While not reported, D_t was also tested using the KPSS test with the constant and linear trend specification. It was found that while the null hypothesis that D_t was stationary was rejected at the 5 per cent level, it was accepted at the 1 per cent level.

[587] Granger, C. W. J. and Newbold, P. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2, 111-120.

[588] The Royal Swedish Academy of Sciences (2003) The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2003 – Information for the Public: Statistical Methods for Economic Time Series. Stockholm. http://nobelprize.org/nobel_prizes/economics/laureates /2003/public.html. [Accessed 14 September 2006]

[589] Granger, C. W. J. (1981) Some Properties of the Time Series Data and Their Use in Econometric Model Specification. *Journal of Econometrics* 16, 121-130.

Where a linear combination of nonstationary variables are cointegrated then ordinary least squares (OLS) analysis can still provide a satisfactory framework for evaluating econometric evidence.[590]

A1.5 Estimation

For using time series data of a monthly duration, Dahl and Sterner observe that problems of seasonal variation are inevitable.[591] In order to account for seasonal variation, 11 seasonal dummy variables for each of the 12 months excluding May have been included in both models. The effect of any seasonal variation in regard to May will be reflected in the constant term. The 11 monthly seasonal dummy variables should be interpreted as any seasonal variation from the month of May.

Dahl has argued that a lagged endogenous model using monthly or quarterly should not be relied upon for estimating long-run elasticities.[592] However, in contrast, Epsey has found that long-run estimates derived from models using monthly or quarterly data were not significantly different from models using annual data.[593] On this basis, Epsey has concluded that there is no reason to expect differences in the long-run estimates of elasticity due to the periodicity of the data, and that a properly specified model with a dynamic structure should

[590] Stock, J. H. and Watson, M. W. (1988) Variable Trends in Economic Time Series. *The Journal of Economic Perspectives* 2, 147-174, pp. 164-165.
[591] Dahl, C. and Sterner, T., *op.cit.*, p. 205.
[592] Dahl, C. (1986) Gasoline Demand Survey. *The Energy Journal* 7, 67-82, p. 69.
[593] Espey, M. (1998) Gasoline demand revisited: an international meta-analysis of elasticities. *Energy Economics* 20, 273-295, p. 289.

be able to capture the same long-run effects using monthly, quarterly, or annual data.[594]

A1.6 Results

An ordinary least squares regression for the lagged endogenous model has been estimated with 100 observations.[595] As the model exhibited signs of first order autocorrelation (according to Durbin's *m* test), the model was re-estimated using the heteroscedasticity and autocorrelation-consistent (HAC) standard errors as developed by Newey and West.[596] This will ensure that the standard errors are robust in the event of both heteroscedasticity and autocorrelation of an unknown form.

The results are reported below in table 26 as equation A1.4.

[594] *ibid.*, p. 289.
[595] Eviews 5.0 was used in the estimation process.
[596] Newey, W. K. and West, K. D. (1987) Hypothesis Testing with Efficient Method of Moments Estimation. *International Economic Review* 28, 777-787.

Table 26: OLS Regression for Unleaded Petrol Demand in Australia (HAC t-statistics in brackets)

Variable	Equation A1.4 (HAC standard errors)
Constant	-1.991 (-2.726)*
Y_t	0.470 (3.492)*
P_t	-0.115 (-2.105)*
D_{t-1}	0.697 (11.283)*
June	-0.069 (-3.226)*
July	-0.006 (-0.256)
August	-0.003 (-0.181)
September	-0.048 (-2.688)*
October	0.017 (1.059)
November	-0.051 (-3.114)*
December	0.006 (0.271)
January	-0.111 (-4.496)*
February	-0.054 (-2.596)*
March	0.107 (5.644)*
April	-0.036 (-1.767)
R-squared	0.875
Adjusted R-squared	0.855
AIC	-3.420
SC	-3.029
F-statistic	41.687*
Durbin-Watson Statistic	2.476
Durbin's *m* test	11.367*

*Statistically significant at the 5 per cent level.

The R-squared and adjusted R-squared for equation A1.4 indicates the model fits the data quite well. Equation A1.4 has reasonably high R-squared and adjusted R-squared values with the Durbin-Watson statistic being high enough

to suggest that the equation is not spurious on the basis of the criterion outlined by Granger and Newbold.[597]

The estimated coefficients on the log of the real price of unleaded petrol and the log of real per capita income have the expected *a priori* signs and the t-statistics indicate that these explanatory variables are statistically significant at less than the 5 per cent level.

Granger has suggested two methods for testing whether a cointegrating relationship exists within an equation: the first is through testing whether the residuals from the equation are stationary; and the second is through testing whether the Durbin-Watson statistic is significantly greater than zero.[598] In the first instance, a unit root test using the Dickey-Fuller test, which in this instance is known as the Engle-Granger (EG) test, was performed on the residuals from equation A1.4 to determine whether they are stationary.[599] The results are reported below in table 27.

Table 27: Engle-Granger Test of the Residuals from Equation A1.4

Variable	EG test with Constant	EG test with Constant and trend
ε_t	-12.604	-12.574

The critical values for the EG test at the 1 per cent level with 100 observations is -4.07. On the basis of the EG test, the alternative hypothesis that the residuals

[597] See: Granger, C. W. J. and Newbold, P., *op.cit.*
[598] Granger, C. W. J. (1986) Developments in the Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics* 48, 213-228.
[599] The lag length for the Augmented Dickey-Fuller test conducted was undertaken using the Schwarz Information Criteria in Eviews 5.0 which was zero, resulting in the Augmented Dickey-Fuller test becoming a Dickey-Fuller test.

from equation A1.4 do not contain a unit root and are stationary is accepted at less than the 1 per cent level.

Cointegration can also be tested for through the Cointegrating Regression Durbin Watson (CRDW) test which involves examining the Durbin-Watson statistic of the cointegrating regression. The CRDW test rejects non-cointegration if the Durbin-Watson statistic is too big. According to Engle and Granger, the critical value of the Durbin-Watson statistic at the 1 per cent level of significance for 100 observations is 0.511.[600] The Durbin-Watson statistic for equation A1.4 is significantly above the critical value at the 1 per cent level of significance. Thus, from examining the Durbin-Watson statistic for equation A1.4 it is concluded that a cointegrating relationship exists between the main variables of interest in the equation.

A1.7 Interpretation

The properties of equation A1.4 are quite acceptable and generally consistent with previous findings in relation to petrol demand functions.

Demand is much less price inelastic in the long-run (-0.38) than it is in the short-run (-0.12) which is consistent with the findings of numerous other studies. The short-run estimate of price elasticity of demand of -0.12 is

[600] Engle, R. F. and Granger, C. W. J. (1987) Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* 55, 251-276.

consistent with findings by Sterner and Dahl that dynamic petrol demand functions generally produce results in the range of -0.1 and -0.3.[601]

Within the Australian context, the short-run price elasticity of demand obtained of -0.12 is similar in magnitude and consistent with previous estimates by Donnelly in the order of between -0.10 to -0.12, although these estimates are quite dated.[602]

Results show a short-run income elasticity of demand of 0.47, rising to 1.55 in the long-run. This suggests that while unleaded petrol is a normal good in the short-run, it becomes a superior good in the long-run.[603] The short-run estimate for income elasticity of 0.47 is consistent with findings by Sterner and Dahl that dynamic petrol demand functions generally produce results in the range of 0.15 to 0.5.[604]

Within the Australian context, the short-run income elasticity of demand of 0.47 is much higher than previous estimates by Donnelly that ranged from 0.12 to 0.18, although as previously observed, Donnelly's estimates are somewhat dated.

The estimated long-run income elasticity of 1.55 is generally higher than estimates obtained from overseas studies. Graham and Glaister have found that

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[601] Sterner, T. and Dahl, C. (1992) Modelling transport fuel demand. In Sterner T. (ed.) *International Energy Economics*. Chapman and Hall, London, p. 77.
[602] Donnelly, W. A. (1982) The Regional Demand for Petrol in Australia. *The Economic Record* 58, 317-327.
[603] A normal good is a good for which demand will increase as income increases. On the other hand, a superior good will make up a larger proportion of consumption as income increases.
[604] Sterner, T. and Dahl, C., *op.cit.*, p. 77.

the long-run income elasticity of demand is generally higher than 1 and in range of between 1.1 and 1.3.[605] However, estimates in excess of 1.3 are not uncommon, with some studies arriving at estimates in excess of 2.[606]

In regard to the model, it was found that the short-run elasticities for income and price were about a third of the long-run values. This is also consistent with the findings of Dahl and Sterner.[607]

[605] Graham, D. J. and Glaister, S., *op.cit.*, p. 10.
[606] See: Sterner, T., Dahl, C. and Franzen, M. (1992) Gasoline Tax Policy, Carbon Emissions and the Global Environment. *Journal of Transport Economics and Policy* 26, 109-119; Espey, M., *op.cit.*, p. 278.
[607] Dahl, C. and Sterner, T., *op.cit.*, p. 207.

Appendix 2: NIM Data

Table 28: Notional Industry Margins for Adelaide, Melbourne and Sydney in the week commencing (WC)

Date	Adelaide	Melbourne	Sydney
WC 30 Jun 1997	5.3	7.5	8.1
WC 7 Jul 1997	4.9	6.1	7.4
WC 14 Jul 1997	5.0	7.1	6.4
WC 21 Jul 1997	4.5	6.9	7.2
WC 28 Jul 1997	5.4	3.7	6.5
WC 4 Aug 1997	6.0	7.1	6.3
WC 11 Aug 1997	6.2	7.5	6.2
WC 18 Aug 1997	8.5	8.6	6.7
WC 25 Aug 1997	8.5	8.1	7.8
WC 1 Sep 1997	6.5	6.5	6.8
WC 8 Sep 1997	7.3	6.6	6.5
WC 15 Sep 1997	8.2	6.7	7.2
WC 22 Sep 1997	7.7	6.4	6.8
WC 29 Sep 1997	6.7	6.0	6.2
WC 6 Oct 1997	5.9	5.1	5.5
WC 13 Oct 1997	6.5	5.1	6.0
WC 20 Oct 1997	6.2	6.2	6.6
WC 27 Oct 1997	4.1	4.0	5.6
WC 3 Nov 1997	4.7	4.6	5.8
WC 10 Nov 1997	3.9	5.1	5.7
WC 17 Nov 1997	4.9	7.4	6.3
WC 24 Nov 1997	6.1	8.9	6.9
WC 1 Dec 1997	7.1	7.9	6.7
WC 8 Dec 1997	5.4	7.7	6.9
WC 15 Dec 1997	6.3	6.8	8.2
WC 22 Dec 1997	6.7	7.4	8.5
WC 29 Dec 1997	6.3	7.1	8.1
WC 5 Jan 1998	6.1	7.0	8.0
WC 12 Jan 1998	6.1	4.5	7.0
WC 19 Jan 1998	4.9	5.4	7.3
WC 26 Jan 1998	4.6	5.6	6.9
WC 2 Feb 1998	4.7	6.8	6.9
WC 9 Feb 1998	6.6	5.2	8.7
WC 16 Feb 1998	6.4	6.1	8.7
WC 23 Feb 1998	6.6	5.0	8.5
WC 2 Mar 1998	6.0	5.4	8.2
WC 9 Mar 1998	5.9	4.7	8.9
WC 16 Mar 1998	5.3	4.5	8.4
WC 23 Mar 1998	5.4	4.5	8.3
WC 30 Mar 1998	6.0	4.3	7.7
WC 6 Apr 1998	5.2	5.4	8.1
WC 13 Apr 1998	6.1	5.2	7.6
WC 20 Apr 1998	6.7	4.0	6.5
WC 27 Apr 1998	5.8	4.2	6.6

WC 4 May 1998	4.9	4.8	6.3
WC 11 May 1998	6.0	3.6	6.0
WC 18 May 1998	5.0	4.1	6.0
WC 25 May 1998	5.8	4.5	6.9
WC 1 Jun 1998	6.5	5.2	7.5
WC 8 Jun 1998	6.2	5.3	7.1
WC 15 Jun 1998	7.0	5.0	6.8
WC 22 Jun 1998	6.6	4.3	6.6
WC 29 Jun 1998	5.9	5.7	6.3
WC 6 July 1998	5.0	4.8	6.8
WC 13 July 1998	5.2	4.6	7.1
WC 20 July 1998	4.7	5.4	7.5
WC 27-Jul-1998	5.1	4.3	7.3
WC 03-Aug-1998	4.4	5.2	7.0
WC 10-Aug-1998	6.0	6.4	8.1
WC 17-Aug-1998	5.9	6.0	7.7
WC 24-Aug-1998	4.9	5.4	7.1
WC 31-Aug-1998	5.4	5.8	7.6
WC 07-Sep-1998	8.9	5.5	7.5
WC 14-Sep-1998	8.2	5.0	6.8
WC 21-Sep-1998	5.8	4.5	5.4
WC 28-Sep-1998	5.5	4.3	5.4
WC 05-Oct-1998	6.2	4.7	6.0
WC 12-Oct-1998	6.6	4.7	7.0
WC 19-Oct-1998	6.8	5.3	7.2
WC 26-Oct-1998	6.7	5.5	7.1
WC 02-Nov-1998	7.1	6.0	7.1
WC 09-Nov-1998	7.0	5.6	7.7
WC 16-Nov-1998	6.7	6.5	8.2
WC 23-Nov-1998	6.3	6.2	8.3
WC 30-Nov-1998	7.6	6.6	8.4
WC 07-Dec-1998	6.1	6.4	7.9
WC 14-Dec-1998	4.9	4.8	7.7
WC 21-Dec-1998	5.3	5.3	7.2
WC 28-Dec-1998	5.4	5.5	7.0
WC 04-Jan-1999	5.6	4.7	6.9
WC 11-Jan-1999	6.0	4.3	6.7
WC 18-Jan-1999	5.4	5.6	7.1
WC 25-Jan-1999	5.7	5.9	7.4
WC 01-Feb-1999	5.6	6.0	7.5
WC 08-Feb-1999	5.0	4.0	7.2
WC 15-Feb-1999	4.5	6.1	6.6
WC 22-Feb-1999	4.2	6.9	6.1
WC 01-Mar-1999	5.3	5.5	5.9
WC 08-Mar-1999	7.5	2.6	5.9
WC 15-Mar-1999	6.6	5.7	5.4
WC 22-Mar-1999	4.3	7.0	5.0
WC 29-Mar-1999	5.3	6.6	5.3

WC 05-Apr-1999	5.4	3.8	4.7
WC 12-Apr-1999	5.4	6.3	5.7
WC 19-Apr-1999	6.3	6.1	6.1
WC 26-Apr-1999	5.4	4.2	6.2
WC 03-May-1999	5.1	4.3	5.4
WC 10-May-1999	5.9	4.1	6.1
WC 17-May-1999	6.6	3.6	7.4
WC 24-May-1999	7.0	3.6	7.4
WC 31-May-1999	5.6	3.0	7.0
WC 07-Jun-1999	4.9	5.5	6.7
WC 14-Jun-1999	5.1	2.3	5.6
WC 21-Jun-1999	4.8	3.4	4.6
WC 28-Jun-1999	5.0	2.9	5.2
WC 05-Jul-1999	5.5	4.5	5.3
WC 12-Jul-1999	6.0	5.4	4.7
WC 19-Jul-1999	5.7	4.7	4.8
WC 26-Jul-1999	4.5	6.0	4.6
WC 02-Aug-1999	6.2	5.5	4.8
WC 09-Aug-1999	5.5	3.7	4.2
WC 16-Aug-1999	4.7	2.8	4.8
WC 23-Aug-1999	4.6	2.8	5.1
WC 30-Aug-1999	4.5	2.9	4.7
WC 06-Sep-1999	4.9	2.0	4.2
WC 13-Sep-1999	5.3	4.3	4.6
WC 20-Sep-1999	3.7	4.2	5.0
WC 27-Sep-1999	3.4	3.8	4.9
WC 04-Oct-1999	4.5	3.3	5.1
WC 11-Oct-1999	4.8	3.0	5.2
WC 18-Oct-1999	4.2	1.3	4.9
WC 25-Oct-1999	4.6	2.9	4.2
WC 01-Nov-1999	5.6	2.1	4.1
WC 08-Nov-1999	4.2	2.7	4.1
WC 15-Nov-1999	4.1	3.1	3.8
WC 22-Nov-1999	3.6	2.4	4.2
WC 29-Nov-1999	5.2	4.1	4.9
WC 06-Dec-1999	6.2	5.0	5.8
WC 13-Dec-1999	5.9	5.0	5.3
WC 20-Dec-1999	4.5	5.2	5.1
WC 27-Dec-1999	4.5	4.1	4.6
WC 03-Jan-2000	5.3	5.9	5.4
WC 10-Jan-2000	3.7	5.7	5.0
WC 17-Jan-2000	3.1	2.4	3.3
WC 24-Jan-2000	2.3	1.5	2.9
WC 31-Jan-2000	3.3	3.3	3.6
WC 07-Feb-2000	5.5	2.2	4.4
WC 14-Feb-2000	4.6	1.5	3.7
WC 21-Feb-2000	4.5	3.0	4.8
WC 28-Feb-2000	5.3	4.0	5.0

WC 06-Mar-2000	3.3	3.7	4.1
WC 13-Mar-2000	4.4	3.8	6.8
WC 20-Mar-2000	6.7	6.5	9.3
WC 27-Mar-2000	7.0	6.3	8.9
WC 03-Apr-2000	4.4	4.3	8.5
WC 10-Apr-2000	4.8	4.2	7.0
WC 17-Apr-2000	4.0	3.3	5.8
WC 24-Apr-2000	3.6	1.8	4.7
WC 01-May-2000	3.9	3.0	3.9
WC 08-May-2000	4.3	2.7	3.7
WC 15-May-2000	1.8	0.1	3.4
WC 22-May-2000	3.1	2.5	3.9
WC 29-May-2000	4.9	2.3	5.8
WC 05-Jun-2000	4.0	3.3	4.9
WC 12-Jun-2000	3.9	3.4	4.9
WC 19-Jun-2000	4.1	1.6	4.0
WC 26-Jun-2000	4.3	4.2	5.7
WC 03-Jul-2000	2.3	2.7	2.3
WC 10-Jul-2000	3.3	3.5	4.1
WC 17-Jul-2000	2.4	1.2	3.2
WC 24-Jul-2000	2.9	1.4	3.6
WC 31-Jul-2000	3.3	0.8	2.4
WC 07-Aug-2000	2.0	1.1	1.3
WC 14-Aug-2000	2.8	3.7	1.2
WC 21-Aug-2000	1.6	4.0	4.4
WC 28-Aug-2000	3.3	4.5	5.1
WC 04-Sep-2000	5.5	3.6	3.8
WC 11-Sep-2000	4.1	5.3	2.8
WC 18-Sep-2000	3.6	3.1	3.0
WC 25-Sep-2000	5.1	6.5	5.1
WC 02-Oct-2000	5.1	6.7	5.1
WC 09-Oct-2000	4.6	7.7	5.7
WC 16-Oct-2000	1.6	3.7	4.4
WC 23-Oct-2000	3.6	5.1	5.9
WC 30-Oct-2000	5.3	4.7	5.9
WC 06-Nov-2000	5.2	3.9	6.3
WC 13-Nov-2000	4.0	3.5	5.0
WC 20-Nov-2000	3.1	1.0	2.0
WC 27-Nov-2000	0.9	2.8	2.9
WC 04-Dec-2000	2.9	4.5	6.0
WC 11-Dec-2000	7.7	7.1	6.4
WC 18-Dec-2000	7.8	10.3	9.9
WC 25-Dec-2000	4.7	9.3	10.8
WC 01-Jan-2001	4.1	7.6	8.4
WC 08-Jan-2001	3.0	4.6	4.7
WC 15-Jan-2001	0.2	3.4	3.5
WC 22-Jan-2001	5.5	4.0	1.6
WC 29-Jan-2001	5.2	4.3	3.7

WC 05-Feb-2001	4.8	3.7	4.4
WC 12-Feb-2001	5.4	4.2	5.3
WC 19-Feb-2001	5.7	4.5	4.8
WC 26-Feb-2001	3.1	2.5	5.7
WC 05-Mar-2001		4.5	4.8
WC 12-Mar-2001		2.7	3.9
WC 19-Mar-2001		4.6	2.8
WC 26-Mar-2001		4.4	5.9
WC 02-Apr-2001		4.1	4.5
WC 09-Apr-2001		4.1	3.3
WC 16-Apr-2001		1.6	2.1
WC 23-Apr-2001		0.9	2.4
WC 30-Apr-2001		1.8	2.2
WC 07-May-2001		1.1	3.0
WC 14-May-2001		2.4	4.3
WC 21-May-2001		1.4	3.2
WC 28-May-2001		1.5	6.0
WC 04-Jun-2001		4.9	6.2
WC 11-Jun-2001		1.8	2.0
WC 18-Jun-2001		3.9	4.6
WC 25-Jun-2001		3.3	3.2
WC 02-Jul-2001		2.9	4.6
WC 09-Jul-2001		2.1	4.6
WC 16-Jul-2001		0.4	5.4
WC 23-Jul-2001		4.6	4.1
WC 30-Jul-2001		4.1	3.9
WC 06-Aug-2001		4.2	2.3
WC 13-Aug-2001		3.7	2.4
WC 20-Aug-2001		3.2	3.8
WC 27-Aug-2001		2.3	3.6
WC 03-Sep-2001		3.2	1.5
WC 10-Sep-2001		0.5	2.8
WC 17-Sep-2001		0.0	4.2
WC 24-Sep-2001		4.1	7.7
WC 01-Oct-2001		3.4	7.4
WC 08-Oct-2001		6.2	6.5
WC 15-Oct-2001		5.8	6.5
WC 22-Oct-2001		6.7	6.3
WC 29-Oct-2001		5.4	5.2
WC 05-Nov-2001		3.7	5.3
WC 12-Nov-2001		5.8	3.8
WC 19-Nov-2001		7.8	5.7
WC 26-Nov-2001		7.6	4.2
WC 03-Dec-2001		7.5	3.1
WC 10-Dec-2001		5.1	4.6
WC 17-Dec-2001		6.7	5.4
WC 24-Dec-2001		4.2	1.3
WC 31-Dec-2001		4.5	3.5

WC 07-Jan-2002		6.9	6.5
WC 14-Jan-2002		6.6	5.8
WC 21-Jan-2002		6.8	4.7
WC 28-Jan-2002		2.2	3.6
WC 04-Feb-2002		5.0	3.1
WC 11-Feb-2002		5.5	2.7
WC 18-Feb-2002		5.8	5.7
WC 25-Feb-2002		5.9	5.7
WC 04-Mar-2002		6.1	4.1
WC 11-Mar-2002		4.6	3.7
WC 18-Mar-2002		4.2	3.6
WC 25-Mar-2002		5.3	3.6
WC 01-Apr-2002		4.1	4.1
WC 08-Apr-2002		5.6	3.6
WC 15-Apr-2002		6.8	5.0
WC 22-Apr-2002		3.7	2.7
WC 29-Apr-2002		6.0	5.4
WC 06-May-2002		5.7	4.9
WC 13-May-2002		5.6	4.7
WC 20-May-2002		6.3	5.1
WC 27-May-2002		7.3	6.0
WC 03-Jun-2002		7.4	6.5
WC 10-Jun-2002		6.0	6.0
WC 17-Jun-2002		5.6	4.7
WC 24-Jun-2002		4.2	4.7
WC 01-Jul-2002		6.4	6.3
WC 08-Jul-2002		6.9	6.6
WC 15-Jul-2002		6.8	6.0
WC 22-Jul-2002		5.7	4.9
WC 29-Jul-2002		4.9	4.7
WC 05-Aug-2002		5.8	5.5
WC 12-Aug-2002		6.7	5.7
WC 19-Aug-2002		5.9	5.2
WC 26-Aug-2002		5.7	4.9
WC 02-Sep-2002		5.0	5.1
WC 09-Sep-2002		4.9	5.3
WC 16-Sep-2002		5.0	6.6
WC 23-Sep-2002		4.8	6.4
WC 30-Sep-2002		5.6	6.1
WC 07-Oct-2002		7.0	7.1
WC 14-Oct-2002		8.0	7.5
WC 21-Oct-2002		6.8	7.4
WC 28-Oct-2002		8.1	7.9
WC 04-Nov-2002		8.3	8.5
WC 11-Nov-2002		8.7	8.2
WC 18-Nov-2002		8.8	8.0
WC 25-Nov-2002		7.8	7.4
WC 02-Dec-2002		8.1	6.8

WC 09-Dec-2002		6.7	6.8
WC 16-Dec-2002		7.0	7.7
WC 23-Dec-2002		6.0	7.0
WC 30-Dec-2002		6.1	7.0
WC 06-Jan-2003		5.6	6.9
WC 13-Jan-2003		8.2	7.8
WC 20-Jan-2003		7.8	6.9
WC 27-Jan-2003		6.3	6.2
WC 03-Feb-2003		6.2	6.0
WC 10-Feb-2003		5.8	6.0
WC 17-Feb-2003		6.2	6.4
WC 24-Feb-2003		6.6	6.8
WC 03-Mar-2003		7.0	6.9
WC 10-Mar-2003		6.7	6.1
WC 17-Mar-2003		7.0	9.0
WC 24-Mar-2003		8.7	11.8
WC 31-Mar-2003		8.9	11.0
WC 07-Apr-2003		11.7	11.0
WC 14-Apr-2003		7.3	9.1
WC 21-Apr-2003		7.9	8.4
WC 28-Apr-2003		9.0	8.8
WC 05-May-2003		8.4	8.5
WC 12-May-2003		7.1	7.4
WC 19-May-2003		6.4	6.4
WC 26-May-2003		6.1	6.2
WC 02-Jun-2003		5.7	5.9
WC 09-Jun-2003		4.7	5.9
WC 16-Jun-2003		4.0	6.0
WC 23-Jun-2003		6.4	6.2
WC 30-Jun-2003		5.9	5.5
WC 07-Jul-2003		5.5	5.9
WC 14-Jul-2003		4.4	6.4
WC 21-Jul-2003		3.0	6.0
WC 28-Jul-2003		2.7	6.5
WC 04-Aug-2003		2.9	6.0
WC 11-Aug-2003		3.3	5.6
WC 18-Aug-2003		7.8	6.5
WC 25-Aug-2003		4.9	6.7

Appendix 3: Correlograms of NIM

Table 29: Correlogram of Adelaide NIM

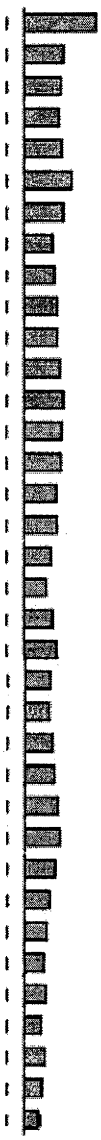
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.635	0.635	78.533	0.000
		2	0.348	-0.091	102.30	0.000
		3	0.323	0.236	122.89	0.000
		4	0.310	0.032	141.94	0.000
		5	0.329	0.170	163.50	0.000
		6	0.420	0.217	198.87	0.000
		7	0.346	-0.084	222.97	0.000
		8	0.262	0.067	236.89	0.000
		9	0.272	0.045	251.96	0.000
		10	0.287	0.054	268.83	0.000
		11	0.291	0.057	286.31	0.000
		12	0.317	0.047	307.09	0.000
		13	0.348	0.131	332.35	0.000
		14	0.335	0.035	355.81	0.000
		15	0.324	0.064	377.89	0.000
		16	0.284	-0.038	394.92	0.000
		17	0.293	0.097	413.23	0.000
		18	0.239	-0.128	425.49	0.000
		19	0.203	-0.002	434.39	0.000
		20	0.260	0.091	449.01	0.000
		21	0.286	-0.006	466.81	0.000
		22	0.224	-0.027	477.78	0.000
		23	0.218	0.009	488.27	0.000
		24	0.246	0.071	501.68	0.000
		25	0.264	0.062	517.18	0.000
		26	0.290	0.016	536.05	0.000
		27	0.305	0.040	557.01	0.000
		28	0.274	0.017	574.08	0.000
		29	0.225	-0.031	585.65	0.000
		30	0.201	-0.051	594.95	0.000
		31	0.177	-0.037	602.20	0.000
		32	0.194	0.031	610.93	0.000
		33	0.154	-0.127	616.49	0.000
		34	0.183	0.109	624.40	0.000
		35	0.156	-0.124	630.21	0.000
		36	0.127	0.044	634.05	0.000

Table 30: Correlogram of Melbourne NIM

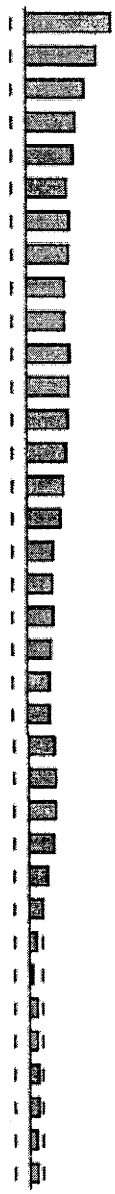
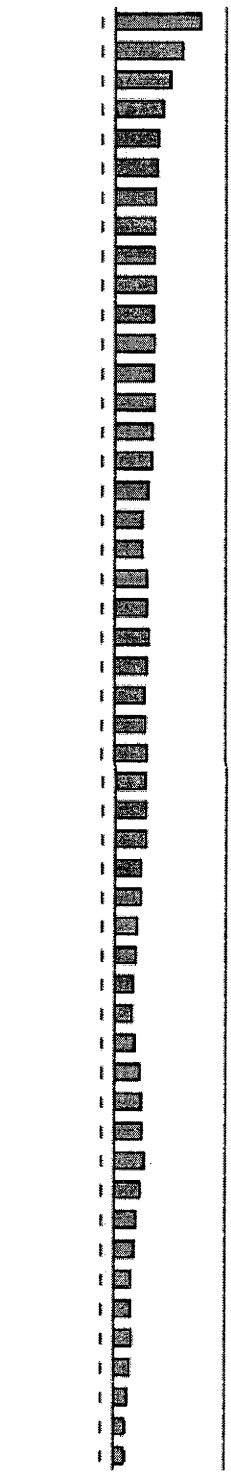
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.721	0.721	169.09	0.000
		2	0.598	0.163	285.77	0.000
		3	0.487	0.018	363.36	0.000
		4	0.423	0.057	422.16	0.000
		5	0.395	0.086	473.53	0.000
		6	0.343	-0.010	512.37	0.000
		7	0.366	0.141	556.64	0.000
		8	0.356	0.042	598.64	0.000
		9	0.324	-0.025	633.53	0.000
		10	0.322	0.065	668.16	0.000
		11	0.362	0.153	712.13	0.000
		12	0.358	0.000	755.23	0.000
		13	0.352	0.029	797.17	0.000
		14	0.329	0.004	833.72	0.000
		15	0.309	-0.005	866.09	0.000
		16	0.285	-0.005	893.69	0.000
		17	0.226	-0.065	911.10	0.000
		18	0.214	0.005	926.85	0.000
		19	0.222	0.049	943.85	0.000
		20	0.204	-0.030	958.19	0.000
		21	0.196	-0.001	971.57	0.000
		22	0.195	0.020	984.85	0.000
		23	0.222	0.056	1002.0	0.000
		24	0.234	0.027	1021.1	0.000
		25	0.232	0.017	1040.0	0.000
		26	0.220	-0.029	1057.0	0.000
		27	0.157	-0.121	1065.7	0.000
		28	0.119	-0.015	1070.8	0.000
		29	0.073	-0.047	1072.7	0.000
		30	0.036	-0.074	1073.2	0.000
		31	0.080	0.120	1075.4	0.000
		32	0.076	-0.013	1077.5	0.000
		33	0.084	-0.015	1080.1	0.000
		34	0.089	0.026	1082.9	0.000
		35	0.068	-0.048	1084.6	0.000
		36	0.082	0.014	1087.1	0.000

Table 31: Correlogram of Sydney NIM



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.810	0.810	213.25	0.000
		2	0.641	-0.043	347.36	0.000
		3	0.525	0.051	437.34	0.000
		4	0.460	0.087	506.77	0.000
		5	0.413	0.032	562.91	0.000
		6	0.408	0.128	617.92	0.000
		7	0.378	-0.036	665.12	0.000
		8	0.372	0.104	711.20	0.000
		9	0.373	0.056	757.67	0.000
		10	0.382	0.062	806.44	0.000
		11	0.362	-0.017	850.41	0.000
		12	0.370	0.099	896.39	0.000
		13	0.366	0.021	941.68	0.000
		14	0.376	0.070	989.66	0.000
		15	0.358	-0.032	1033.1	0.000
		16	0.352	0.050	1075.3	0.000
		17	0.319	-0.044	1110.1	0.000
		18	0.266	-0.092	1134.4	0.000
		19	0.264	0.131	1158.4	0.000
		20	0.306	0.094	1190.8	0.000
		21	0.311	-0.035	1224.4	0.000
		22	0.323	0.052	1260.7	0.000
		23	0.310	-0.031	1294.4	0.000
		24	0.287	-0.011	1323.2	0.000
		25	0.295	0.094	1353.6	0.000
		26	0.307	-0.008	1386.8	0.000
		27	0.286	-0.024	1415.8	0.000
		28	0.290	0.072	1445.7	0.000
		29	0.288	-0.025	1475.2	0.000
		30	0.249	-0.094	1497.3	0.000
		31	0.247	0.108	1519.1	0.000
		32	0.220	-0.110	1536.5	0.000
		33	0.199	0.017	1550.8	0.000
		34	0.176	-0.048	1561.9	0.000
		35	0.167	-0.008	1572.1	0.000
		36	0.190	0.082	1585.3	0.000
		37	0.243	0.098	1606.8	0.000
		38	0.262	-0.003	1632.0	0.000
		39	0.268	0.013	1658.4	0.000
		40	0.283	0.096	1688.1	0.000
		41	0.252	-0.154	1711.7	0.000
		42	0.209	-0.039	1728.0	0.000
		43	0.196	0.063	1742.3	0.000
		44	0.163	-0.063	1752.3	0.000
		45	0.162	0.027	1762.2	0.000
		46	0.164	0.020	1772.4	0.000
		47	0.150	-0.062	1781.0	0.000
		48	0.128	-0.056	1787.3	0.000
		49	0.102	-0.031	1791.3	0.000
		50	0.092	-0.004	1794.5	0.000

Appendix 4: Specification of Dummy Variables

A4.1 Blockade of Melbourne Fuel Terminals in Late September 2000

On Sunday 24 September 2000, truck owner-drivers began a protest over high fuel prices by staging a blockade of the Mobil-BP terminal in Yarraville, the Caltex terminal at Spotswood and the Shell terminal at Newport. Truck owner-drivers parked their trucks outside fuel terminal facilities, and prevented fuel tankers from leaving the terminals.

Shell commented on Monday 25 September 2000 that the fuel blockades by truck owner-drivers were threatening Victorian fuel supplies.[608] Mobil commented that it was "in a very serious position in terms of supply" and newspaper reports suggested that Victoria could start running out of fuel within days.[609] Caltex threatened to take legal action by asking the Supreme Court in Victoria to force truck owner-drivers to end the blockade.[610]

The blockade was eventually lifted on Tuesday 26 September 2000, following discussions between the truck owner-drivers, the then Victorian Premier, Mr Steve Bracks, and the Transport Workers' Union. A spokesman for the truck owner-drivers, Mr Jerry Brown-Sarre, said they decided to lift the blockade after accepting assurances from Mr Bracks that he would raise their concerns

[608] The Shell Company of Australia Limited (2000) Victorian Fuel Blockade – Shell. *Media Release*, 25 September.
[609] *The Age* (2000) Petrol Supplies Start to Dwindle. 26 September: 3.
[610] PM Program (2000) Petrol Blockade. ABC Radio, 25 September; *The Oil Daily* (2000) Truckers Block Fuel Supplies. 27 September.

with the Commonwealth Government at the Premiers' Conference in November 2000.[611]

While fuel deliveries commenced immediately after the blockade was lifted, newspaper reports said that some service station sites had already run out of fuel supplies, with BP closing 12 sites before the blockade was lifted and Caltex commenting that half of its 166 Melbourne sites would have run out of at least one fuel product by Wednesday 27 September 2000.[612]

The ACCC later commented that Melbourne petrol prices had been affected by the blockade of late September 2000.[613] In the period following the blockade, the NIM stayed high for a further two weeks as possibly wholesalers sought to increase margins in order to make up for the period of lost sales and revenues.

A4.2 Christmas 2000

The Christmas and New Year holiday period during 2000 was a period of high retail petrol prices in Adelaide, Melbourne and Sydney coupled with an abnormally high NIM. This retail petrol price spike occurred against a backdrop of a higher Australian/US dollar exchange rate and a lower price for Singapore refined product, thus leading to an increase in the level of NIM recorded in all three cities.[614] While explanations differ as to the reasons, the high level of

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[611] *The Australian* (2000) Bracks douses truckies' fuel rage. 27 September: 28; Bracks, S. (2000) Bracks Government Slams Howard over Crisis Facing Owner Drivers. *Media Release*, Premier of Victoria, 26 September.
[612] *Herald Sun* (2000) State's petrol flows again. 27 September 2000: 9.
[613] Australian Competition and Consumer Commission (2000) *Report on the Movement in Fuel Prices in the September Quarter 2000*. Canberra.
[614] Australian Competition and Consumer Commission (2000) ACCC continues to monitor petrol prices. *Media Release*, 21 December.

retail petrol prices recorded during this period was highlighted by motoring organisations, as well as acknowledged by government officials and some of the oil majors at the time.

Both the NRMA and the RACV accused the oil companies of *profiteering* over the Christmas holiday period.[615]

On the other hand, several explanations were offered by the oil majors for the petrol price spike over the Christmas and New Year period and the consequent rise in the NIM. Caltex commented that supply had been restricted in Victoria and New South Wales due to a break in the Bass Strait crude oil pipeline and a problem at the Kurnell refinery in Sydney. [616] It was further reported that Caltex had been experiencing problems with the supply of unleaded petrol in the Sydney market caused by technical problems at its Kurnell refinery.[617] Shell attributed the petrol price spike to production problems encountered at a number of refineries on the eastern seaboard of Australia:

> We've had a number of refinery problems up and down the East Coast of Australia and there are some shortages of petrol around the place. So at the moment what you're seeing is that prices were remaining high due to supply shortages at petrol stations and it is a very, very high demand period caused by the holidays.[618]

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[615] See: PM Program (2000) Petrol prices remain high over Christmas. ABC Radio, 22 December; *The Age* (2001) Oil Companies Are Profiteers: RACV. 1 January: 3.
[616] *Australian Associated Press News Wire* (2000) Fuel shortage could halt petrol price cuts. 15 December.
[617] *The Australian* (2000) City petrol still on a high. 22 December: 15.
[618] PM Program, *op.cit.*

Another reason offered by Shell for the high retail petrol price over the Christmas 2000 holiday period was due to a "not a very strong" retail discounting cycle.[619]

According to a representative of Mobil, there were petrol shortages along the Australian seaboard over the Christmas 2000 period due to several unexpected refineries shutdown at this time, although Adelaide was spared from these shortages to some extent:

> We had three or four refineries around Australia out, and we had a critical shortage that had to be met by imports. We failed to do that effectively on the eastern seaboard. Fortunately, Adelaide was spared some of those issues.[620]

During this period, the Prime Minister, Mr Howard, called on oil companies to cut the retail price of petrol due to the fall in world oil prices and because of the appreciation of the Australian dollar.[621]

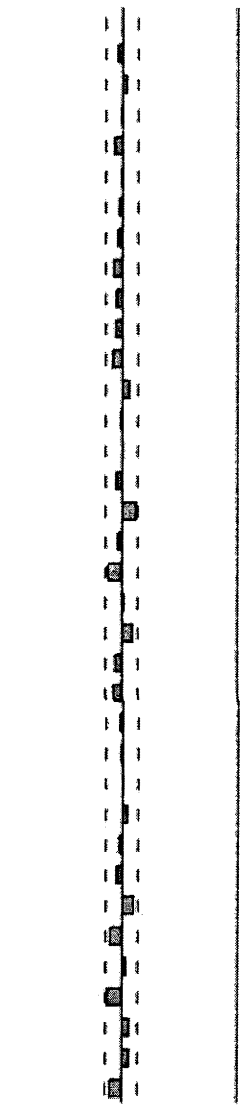
[619] *The Age, op.cit.*
[620] House of Assembly Select Committee on Petrol, Diesel, and LPG Pricing (2001) *Official Hansard Report.* Monday 28 May 2001 at 4.25pm, Parliament of South Australia, Adelaide, p. 56.
[621] *The Australian* (2000) PM tells oil chiefs – cut petrol prices. 30 December: 3.

Appendix 5: Correlograms for Adelaide

Table 32: Correlogram of the Residuals and Q Statistics for Equation 1.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.075	0.075	1.0818	
		2	-0.182	-0.189	7.5466	0.006
		3	-0.033	-0.003	7.7639	0.021
		4	-0.001	-0.034	7.7642	0.051
		5	-0.054	-0.060	8.3430	0.080
		6	-0.007	-0.004	8.3520	0.138
		7	-0.016	-0.039	8.4007	0.210
		8	-0.013	-0.013	8.4330	0.296
		9	-0.064	-0.078	9.2680	0.320
		10	-0.062	-0.064	10.043	0.347
		11	-0.071	-0.095	11.082	0.351
		12	-0.064	-0.090	11.935	0.369
		13	0.083	0.057	13.368	0.343
		14	-0.010	-0.074	13.391	0.418
		15	-0.017	-0.002	13.450	0.491
		16	-0.014	-0.049	13.492	0.564
		17	0.135	0.125	17.337	0.364
		18	-0.030	-0.076	17.528	0.419
		19	-0.138	-0.114	21.584	0.251
		20	0.017	0.011	21.650	0.302
		21	0.123	0.053	24.929	0.204
		22	-0.036	-0.050	25.215	0.238
		23	-0.091	-0.084	27.020	0.210
		24	-0.039	-0.050	27.354	0.241
		25	-0.009	-0.033	27.371	0.287
		26	0.035	0.016	27.639	0.325
		27	0.056	0.041	28.352	0.341
		28	-0.041	-0.072	28.733	0.374
		29	-0.038	-0.017	29.056	0.410
		30	0.100	0.056	31.358	0.349
		31	-0.069	-0.105	32.466	0.346
		32	-0.009	0.040	32.486	0.393
		33	-0.117	-0.197	35.661	0.300
		34	0.081	0.073	37.198	0.282
		35	0.056	-0.019	37.940	0.294
		36	-0.113	-0.098	40.989	0.224

Table 33: Correlogram of the Residuals and Q-statistics for Equation 2.



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.007	0.007	0.0105	
		2	-0.040	-0.040	0.3168	
		3	0.047	0.047	0.7413	0.389
		4	-0.007	-0.010	0.7519	0.687
		5	-0.074	-0.070	1.8236	0.610
		6	-0.002	-0.004	1.8245	0.768
		7	-0.025	-0.030	1.9463	0.857
		8	-0.033	-0.026	2.1638	0.904
		9	-0.075	-0.078	3.2950	0.856
		10	-0.056	-0.062	3.9407	0.862
		11	-0.062	-0.067	4.7191	0.858
		12	-0.086	-0.091	6.2195	0.796
		13	0.073	0.067	7.3206	0.773
		14	-0.016	-0.034	7.3714	0.832
		15	0.015	0.016	7.4179	0.879
		16	-0.053	-0.081	8.0007	0.889
		17	0.123	0.112	11.204	0.738
		18	-0.039	-0.056	11.533	0.775
		19	-0.115	-0.124	14.358	0.642
		20	0.019	-0.008	14.433	0.700
		21	0.091	0.062	16.205	0.644
		22	-0.062	-0.046	17.038	0.650
		23	-0.074	-0.097	18.243	0.634
		24	-0.023	-0.047	18.360	0.684
		25	-0.012	-0.007	18.394	0.736
		26	0.009	0.010	18.410	0.783
		27	0.054	0.045	19.054	0.795
		28	-0.028	-0.065	19.227	0.827
		29	-0.051	-0.048	19.824	0.838
		30	0.102	0.060	22.193	0.772
		31	-0.105	-0.123	24.717	0.693
		32	0.038	0.051	25.057	0.722
		33	-0.131	-0.181	29.032	0.568
		34	0.071	0.049	30.217	0.557
		35	0.066	0.044	31.252	0.554
		36	-0.101	-0.091	33.685	0.483

Appendix 6: Correlograms for Melbourne

Table 34: Correlogram of the Residuals and Q-statistics for Equation 3.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.032	-0.032	0.3421	
		2	0.053	0.052	1.2431	0.265
		3	0.058	0.061	2.3294	0.312
		4	-0.033	-0.033	2.6955	0.441
		5	0.053	0.045	3.6129	0.461
		6	-0.123	-0.121	8.5672	0.128
		7	-0.011	-0.020	8.6081	0.197
		8	0.070	0.077	10.254	0.175
		9	-0.090	-0.070	12.973	0.113
		10	-0.076	-0.099	14.910	0.093
		11	0.014	0.022	14.979	0.133
		12	-0.041	-0.031	15.530	0.160
		13	0.015	0.006	15.607	0.210
		14	-0.026	-0.003	15.843	0.258
		15	-0.005	-0.013	15.851	0.323
		16	0.024	-0.008	16.048	0.379
		17	-0.087	-0.068	18.604	0.290
		18	-0.009	-0.018	18.634	0.350
		19	0.040	0.036	19.172	0.381
		20	-0.024	-0.016	19.370	0.433
		21	0.011	-0.005	19.414	0.495
		22	-0.025	-0.021	19.622	0.545
		23	0.064	0.053	21.066	0.517
		24	0.026	0.017	21.306	0.562
		25	-0.005	0.014	21.316	0.620
		26	0.085	0.066	23.880	0.526
		27	-0.097	-0.118	27.180	0.400
		28	0.004	-0.012	27.186	0.454
		29	-0.065	-0.052	28.698	0.428
		30	-0.160	-0.155	37.798	0.127
		31	0.006	-0.014	37.810	0.155
		32	-0.093	-0.050	40.937	0.109
		33	-0.028	-0.036	41.226	0.127
		34	0.005	-0.006	41.236	0.154
		35	-0.070	-0.042	43.023	0.138
		36	-0.029	-0.075	43.328	0.158

Table 35: Correlogram of the Squared Residuals and Q-statistics for Equation 3.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.137	0.137	6.0974	
		2	0.031	0.012	6.4055	0.011
		3	0.075	0.070	8.2334	0.016
		4	0.051	0.032	9.0921	0.028
		5	0.028	0.015	9.3564	0.053
		6	0.072	0.062	11.077	0.050
		7	0.061	0.038	12.298	0.056
		8	0.062	0.045	13.573	0.059
		9	0.063	0.040	14.908	0.061
		10	0.085	0.062	17.300	0.044
		11	0.025	-0.006	17.511	0.064
		12	0.093	0.078	20.439	0.040
		13	0.162	0.128	29.244	0.004
		14	0.128	0.084	34.763	0.001
		15	-0.057	-0.108	35.868	0.001
		16	0.049	0.035	36.676	0.001
		17	0.126	0.094	42.064	0.000
		18	0.065	0.027	43.493	0.000
		19	0.051	0.012	44.370	0.001
		20	0.143	0.100	51.381	0.000
		21	0.034	-0.019	51.771	0.000
		22	0.075	0.044	53.744	0.000
		23	-0.036	-0.100	54.198	0.000
		24	0.005	-0.008	54.207	0.000
		25	0.042	0.014	54.813	0.000
		26	-0.017	-0.088	54.911	0.001
		27	0.043	0.018	55.560	0.001
		28	0.054	0.039	56.586	0.001
		29	-0.024	-0.052	56.796	0.001
		30	0.009	-0.052	56.825	0.002
		31	0.088	0.066	59.602	0.001
		32	-0.000	-0.030	59.602	0.002
		33	-0.021	-0.051	59.761	0.002
		34	-0.010	-0.061	59.795	0.003
		35	-0.042	-0.030	60.448	0.003
		36	-0.038	-0.030	60.974	0.004

Table 36: Correlogram of the Residuals and Q-statistics for Equation 4.

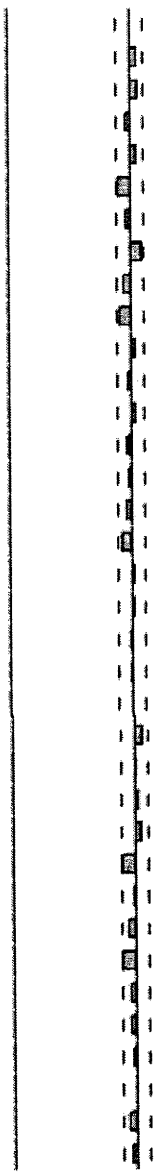
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.004	0.004	0.0043	
		2	0.063	0.063	1.2804	0.258
		3	0.069	0.068	2.8148	0.245
		4	-0.034	-0.038	3.1916	0.363
		5	0.061	0.053	4.3989	0.355
		6	-0.098	-0.100	7.5576	0.182
		7	-0.033	-0.035	7.9184	0.244
		8	0.087	0.093	10.438	0.165
		9	-0.083	-0.065	12.752	0.121
		10	-0.079	-0.097	14.833	0.096
		11	0.027	0.037	15.071	0.129
		12	-0.047	-0.028	15.812	0.148
		13	0.053	0.041	16.753	0.159
		14	-0.054	-0.035	17.751	0.167
		15	-0.023	-0.023	17.925	0.210
		16	-0.006	-0.043	17.939	0.266
		17	-0.116	-0.090	22.501	0.128
		18	0.011	0.017	22.540	0.165
		19	0.009	0.020	22.569	0.208
		20	-0.019	-0.013	22.695	0.251
		21	0.020	-0.001	22.833	0.297
		22	-0.007	0.006	22.849	0.352
		23	0.078	0.068	24.964	0.299
		24	0.029	0.012	25.266	0.337
		25	0.013	0.026	25.326	0.388
		26	0.087	0.053	28.015	0.307
		27	-0.083	-0.108	30.467	0.249
		28	-0.007	-0.012	30.483	0.293
		29	-0.071	-0.063	32.260	0.264
		30	-0.127	-0.109	38.016	0.122
		31	-0.025	-0.041	38.242	0.144
		32	-0.084	-0.044	40.803	0.112
		33	-0.030	-0.022	41.136	0.129
		34	0.015	0.002	41.213	0.154
		35	-0.094	-0.060	44.411	0.109
		36	-0.011	-0.036	44.452	0.131

Table 37: Correlogram of the Squared Residuals and Q-statistics for Equation 4.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.088	-0.088	2.5225	
		2	0.012	0.004	2.5688	0.109
		3	0.079	0.081	4.5920	0.101
		4	0.025	0.040	4.7997	0.187
		5	-0.006	-0.003	4.8134	0.307
		6	0.058	0.051	5.9362	0.312
		7	-0.021	-0.016	6.0769	0.415
		8	0.033	0.028	6.4320	0.490
		9	0.002	-0.000	6.4337	0.599
		10	0.053	0.053	7.3591	0.600
		11	-0.009	-0.003	7.3838	0.689
		12	0.057	0.051	8.4835	0.669
		13	0.065	0.070	9.9226	0.623
		14	0.110	0.119	14.027	0.372
		15	-0.091	-0.081	16.853	0.264
		16	0.042	0.005	17.453	0.293
		17	0.110	0.102	21.602	0.157
		18	0.034	0.056	22.007	0.184
		19	0.003	0.005	22.009	0.232
		20	0.145	0.121	29.290	0.062
		21	0.058	0.089	30.441	0.063
		22	0.034	0.030	30.839	0.076
		23	-0.037	-0.065	31.316	0.090
		24	0.002	-0.036	31.318	0.115
		25	0.037	0.032	31.809	0.132
		26	-0.018	-0.042	31.918	0.160
		27	0.032	0.016	32.287	0.184
		28	0.061	0.062	33.603	0.178
		29	-0.041	-0.020	34.192	0.195
		30	0.013	-0.051	34.254	0.230
		31	0.032	-0.012	34.609	0.257
		32	-0.007	-0.005	34.628	0.299
		33	-0.036	-0.070	35.102	0.323
		34	0.006	-0.071	35.116	0.368
		35	-0.043	-0.047	35.796	0.384
		36	0.001	0.009	35.796	0.431

Appendix 7: Correlograms for Sydney

Table 38: Correlogram of the Residuals and Q-statistics for Equation 5.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.022	0.022	0.1498	
		2	-0.033	-0.034	0.5142	0.473
		3	-0.001	0.000	0.5148	0.773
		4	0.031	0.030	0.8322	0.842
		5	-0.061	-0.062	2.0495	0.727
		6	0.062	0.067	3.3072	0.653
		7	-0.074	-0.082	5.0949	0.532
		8	-0.040	-0.033	5.6340	0.583
		9	-0.056	-0.056	6.6848	0.571
		10	0.021	0.014	6.8359	0.654
		11	-0.094	-0.088	9.7944	0.459
		12	-0.035	-0.041	10.216	0.511
		13	-0.043	-0.041	10.835	0.543
		14	0.061	0.052	12.096	0.520
		15	-0.069	-0.070	13.717	0.471
		16	0.037	0.026	14.192	0.511
		17	0.014	0.013	14.257	0.580
		18	-0.110	-0.132	18.377	0.365
		19	-0.110	-0.103	22.559	0.208
		20	0.120	0.084	27.497	0.094
		21	-0.011	-0.013	27.539	0.121
		22	-0.007	-0.016	27.555	0.153
		23	0.035	0.026	27.976	0.176
		24	-0.109	-0.138	32.110	0.098
		25	-0.010	0.018	32.145	0.123
		26	0.105	0.054	36.051	0.071
		27	-0.061	-0.078	37.373	0.069
		28	0.016	0.033	37.470	0.087
		29	0.052	0.034	38.443	0.090
		30	-0.078	-0.124	40.626	0.074
		31	0.064	0.085	42.068	0.071
		32	-0.019	-0.047	42.203	0.086
		33	0.027	0.035	42.464	0.102
		34	-0.014	-0.021	42.532	0.124
		35	-0.069	-0.091	44.273	0.112
		36	-0.038	-0.043	44.810	0.124

Table 39: Correlogram of the Squared Residuals and Q-statistics for Equation 5.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.121	0.121	4.7069	
		2	0.206	0.194	18.516	0.000
		3	0.106	0.065	22.145	0.000
		4	0.119	0.067	26.786	0.000
		5	0.107	0.063	30.568	0.000
		6	0.079	0.027	32.632	0.000
		7	0.071	0.021	34.304	0.000
		8	0.135	0.097	40.326	0.000
		9	0.061	0.010	41.573	0.000
		10	0.073	0.011	43.328	0.000
		11	0.024	-0.021	43.525	0.000
		12	0.124	0.089	48.681	0.000
		13	0.169	0.138	58.268	0.000
		14	0.090	0.020	61.025	0.000
		15	0.267	0.207	85.265	0.000
		16	0.129	0.048	90.905	0.000
		17	0.136	0.015	97.235	0.000
		18	0.163	0.086	106.28	0.000
		19	0.040	-0.052	106.84	0.000
		20	0.169	0.081	116.68	0.000
		21	0.074	-0.003	118.58	0.000
		22	0.088	0.003	121.29	0.000
		23	0.158	0.096	129.93	0.000
		24	0.148	0.094	137.56	0.000
		25	0.154	0.070	145.84	0.000
		26	0.069	-0.016	147.53	0.000
		27	0.109	0.020	151.70	0.000
		28	0.157	0.049	160.44	0.000
		29	0.118	0.038	165.35	0.000
		30	0.164	0.037	174.88	0.000
		31	0.024	-0.094	175.09	0.000
		32	0.013	-0.106	175.15	0.000
		33	0.016	-0.100	175.25	0.000
		34	0.049	0.039	176.13	0.000
		35	0.105	0.049	180.11	0.000
		36	0.091	0.018	183.15	0.000

Table 40: Correlogram of the Residuals and Q-statistics for Equation 6.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.017	0.017	0.0931	
		2	-0.059	-0.059	1.2087	0.272
		3	-0.002	0.000	1.2095	0.546
		4	0.084	0.081	3.5245	0.318
		5	-0.054	-0.057	4.4649	0.347
		6	-0.018	-0.007	4.5749	0.470
		7	-0.032	-0.038	4.9196	0.554
		8	-0.030	-0.038	5.2220	0.633
		9	-0.061	-0.055	6.4511	0.597
		10	-0.002	-0.005	6.4521	0.694
		11	-0.042	-0.045	7.0375	0.722
		12	-0.046	-0.045	7.7549	0.735
		13	-0.046	-0.046	8.4648	0.748
		14	0.043	0.032	9.0973	0.766
		15	-0.073	-0.079	10.887	0.695
		16	0.038	0.043	11.384	0.725
		17	-0.014	-0.029	11.455	0.781
		18	-0.074	-0.091	13.325	0.714
		19	-0.090	-0.085	16.119	0.584
		20	0.071	0.041	17.875	0.531
		21	0.004	-0.013	17.881	0.595
		22	-0.011	-0.006	17.924	0.654
		23	0.005	0.007	17.933	0.710
		24	-0.050	-0.090	18.789	0.713
		25	0.024	0.025	18.997	0.752
		26	0.086	0.065	21.608	0.658
		27	-0.004	-0.021	21.614	0.710
		28	0.000	0.005	21.614	0.757
		29	0.055	0.053	22.704	0.748
		30	-0.093	-0.142	25.790	0.637
		31	0.008	0.023	25.813	0.685
		32	-0.043	-0.060	26.480	0.698
		33	0.067	0.065	28.113	0.664
		34	-0.022	-0.017	28.281	0.701
		35	-0.088	-0.082	31.063	0.612
		36	-0.019	-0.033	31.200	0.652

Table 41: Correlogram of the Squared Residuals and Q-statistics for Equation 6.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.007	0.007	0.0168	
		2	-0.031	-0.031	0.3252	0.569
		3	-0.028	-0.028	0.5876	0.745
		4	0.046	0.045	1.2657	0.737
		5	-0.022	-0.025	1.4304	0.839
		6	-0.016	-0.014	1.5163	0.911
		7	-0.038	-0.036	1.9840	0.921
		8	0.022	0.018	2.1409	0.952
		9	-0.058	-0.060	3.2746	0.916
		10	-0.018	-0.017	3.3832	0.947
		11	-0.060	-0.060	4.5908	0.917
		12	0.041	0.034	5.1598	0.923
		13	0.001	0.000	5.1601	0.952
		14	-0.024	-0.028	5.3603	0.966
		15	0.100	0.108	8.7259	0.848
		16	0.014	-0.001	8.7954	0.888
		17	0.006	0.013	8.8093	0.921
		18	0.023	0.026	8.9957	0.940
		19	-0.048	-0.056	9.7880	0.939
		20	0.049	0.048	10.600	0.937
		21	-0.035	-0.037	11.023	0.946
		22	-0.032	-0.027	11.379	0.955
		23	0.039	0.047	11.914	0.959
		24	0.062	0.063	13.269	0.946
		25	-0.003	0.003	13.271	0.961
		26	-0.032	-0.012	13.634	0.968
		27	-0.030	-0.031	13.950	0.974
		28	0.074	0.062	15.896	0.955
		29	0.038	0.050	16.413	0.959
		30	0.098	0.088	19.811	0.899
		31	-0.027	-0.013	20.068	0.915
		32	-0.009	-0.015	20.096	0.934
		33	-0.068	-0.071	21.738	0.914
		34	0.039	0.058	22.280	0.921
		35	0.053	0.054	23.280	0.917
		36	-0.023	-0.026	23.469	0.931

Appendix 8: Sensitivity Analysis

Table 42: OLS Regression of Adelaide NIM without Autoregressive Terms (t-statistics in brackets)

Variable	**Equation A8.1** (HAC standard errors)
Constant	4.856 (26.541)*
Regulation	1.063 (3.800)*
$Deregulation_1$	1.395 (4.485)*
$Deregulation_2$	0.683 (2.893)*
exREAs	-1.055 (-4.096)*
Merger	3.017 (15.755)*
Christmas2000	3.974 (21.667)*
R-squared	0.485
Adjusted R-squared	0.469
Durbin-Watson Statistic	1.211
AIC	2.956
SC	3.075
White's Heteroscedasticity Test	10.634
Durbin's *m* test	29.708*
F-statistic	29.091*

*Statistically significant at the 5 per cent level.

Table 43: OLS Regression of Melbourne NIM without the Autoregressive Term (t-statistics in brackets)

Variable	Equation A8.2 (HAC standard errors)
Constant	3.283 (16.597)*
Regulation$_1$	3.292 (8.007)*
Regulation$_2$	1.760 (5.930)*
Deregulation$_1$	2.234 (7.420)*
Deregulation$_2$	1.549 (3.645)*
Merger	3.114 (15.591)*
Blockade	3.673 (13.926)*
Christmas2000	5.311 (16.243)*
TG	1.834 (3.925)*
exREAs	1.468 (2.873)*
Iraq	3.188 (6.625)*
Coles	-2.946 (-5.729)*
R-squared	0.549
Adjusted R-squared	0.533
Durbin-Watson Statistic	1.089
AIC	3.411
SC	3.552
White's Heteroscedasticity Test	25.054*
Durbin's *m* test	66.534*
F-statistic	34.363*

*Statistically significant at the 5 per cent level.

Table 44: OLS Regression of Sydney NIM without the Autoregressive Term (t-statistics in brackets)

Variable	**Equation A8.3 (HAC standard errors)**
Constant	4.385 (30.043)*
Regulation	2.693 (10.140)*
Deregulation$_1$	2.853 (8.704)*
Deregulation$_2$	1.850 (5.641)*
Merger	3.976 (14.007)*
Christmas2000	4.484 (9.700)*
exREAs	2.172 (7.403)*
Iraq	3.813 (10.780)*
R-squared	0.622
Adjusted R-squared	0.614
Durbin-Watson Statistic	1.013
AIC	3.077
SC	3.171
White's Heteroscedasticity Test	20.653*
Durbin's *m* test	78.398*
F-statistic	73.969*

*Statistically significant at the 5 per cent level.

Table 45: OLS Regressions of Adelaide NIM with the *GST* explanatory variable (t-statistics in brackets)

Variable	Equation A8.4 (White's heteroscedasticity-robust standard errors)	Equation A8.4 (HAC standard errors)
Constant	4.821 (26.243)*	4.821 (26.018)*
Regulation	1.150 (4.728)*	1.150 (4.121)*
Deregulation$_1$	1.381 (4.080)*	1.381 (4.115)*
Deregulation$_2$	0.712 (2.737)*	0.712 (2.975)*
exREAs	-0.704 (-2.237)*	-0.704 (-2.769)*
Merger	2.523 (7.650)*	2.523 (11.978)*
GST	-0.499 (-1.177)	-0.499 (-1.386)
Christmas2000	3.723 (9.267)*	3.723 (11.079)*
AR(1)	0.481 (5.401)*	0.481 (6.871)*
AR(2)	-0.208 (-2.757)*	-0.208 (-2.956)*
R-squared	0.590	
Adjusted R-squared	0.570	
AIC	2.771	
SC	2.942	
White's Heteroscedasticity Test	17.660*	
F-statistic	28.833*	
Inverted AR Roots	.24..+39i .24 -39i	

*Statistically significant at the 5 per cent level.

Table 46: OLS Regressions of Melbourne NIM with the *GST* explanatory variable (t-statistics in brackets)

Variable	Equation A8.5 (White's heteroscedasticity-robust standard errors)	Equation A8.5 (HAC standard errors)
Constant	3.488 (12.542)*	3.488 (11.171)*
Regulation$_1$	2.950 (5.560)*	2.950 (5.530)*
Regulation$_2$	1.587 (4.084)*	1.587 (3.905)*
Deregulation$_1$	2.064 (6.117)*	2.064 (5.300)*
Deregulation$_2$	1.282 (2.471)*	1.282 (2.531)*
Merger	2.567 (8.206)*	2.567 (13.037)*
GST	-0.225 (-0.540)	-0.225 (-0.511)
Blockade	3.707 (9.650)*	3.707 (15.268)*
Christmas2000	4.207 (4.291)*	4.207 (8.531)*
TG	1.544 (3.161)*	1.544 (2.721)*
exREAs	1.532 (3.421)*	1.532 (2.894)*
Iraq	3.117 (3.134)*	3.117 (5.193)*
Coles	-2.745 (-3.028)*	-2.745 (-3.380)*
AR(1)	0.471 (7.813)*	0.471 (7.815)*
R-squared	0.644	
Adjusted R-squared	0.629	
AIC	3.186	
SC	3.351	
White's Heteroscedasticity Test	30.652*	
F-statistic	42.726*	
Inverted AR Root	.47	

*Statistically significant at the 5 per cent level.

Table 47: OLS Regressions of Sydney NIM with the *GST* explanatory variable (t-statistics in brackets)

Variable	Equation A8.6 (White's heteroscedasticity-robust standard errors)	Equation A8.6 (HAC standard errors)
Constant	4.957 (20.058)*	4.957 (19.889)*
Regulation	2.096 (6.942)*	2.096 (5.974)*
$Deregulation_1$	2.145 (6.293)*	2.145 (5.483)*
$Deregulation_2$	1.178 (3.183)*	1.178 (2.516)*
Merger	2.661 (3.670)*	2.661 (6.632)*
GST	-0.694 (-1.717)	-0.694 (-1.775)
Christmas2000	3.111 (2.218)*	3.111 (4.672)*
exREAs	1.659 (5.168)*	1.659 (4.309)*
Iraq	2.718 (3.195)*	2.718 (3.666)*
AR(1)	0.550 (10.320)*	0.550 (9.234)*
R-squared	0.725	
Adjusted R-squared	0.717	
AIC	2.772	
SC	2.889	
White's Heteroscedasticity Test	60.564*	
F-statistic	91.036*	
Inverted AR Root	.55	

*Statistically significant at the 5 per cent level.

Appendix 9: Test for Structural Change in Sydney

Table 48: OLS Regressions of Sydney NIM with *TG* explanatory variable (t-statistics in brackets)

Variable	Equation A9.1 (White's heteroscedasticity-robust standard errors)	Equation A9.2 (HAC standard errors)
Constant	4.504 (19.000)*	4.504 (21.970)*
Regulation	2.549 (8.702)*	2.549 (7.925)*
$Deregulation_1$	2.597 (7.835)*	2.597 (7.129)*
$Deregulation_2$	1.592 (4.223)*	1.592 (3.370)*
Merger	2.863 (3.543)*	2.863 (6.144)*
Christmas2000	3.023 (2.163)*	3.023 (4.549)*
TG	-0.025 (-0.051)	-0.025 (-0.055)
exREAs	2.146 (4.893)*	2.146 (4.596)*
Iraq	2.725 (3.214)*	2.725 (3.702)*
AR(1)	0.546 (10.232)*	0.546 (9.310)*
R-squared	0.721	
Adjusted R-squared	0.713	
AIC	2.785	
SC	2.902	
White's Heteroscedasticity Test	43.558*	
F-statistic	89.401*	
Inverted AR Roots	.55	

*Statistically significant at the 5 per cent level.

Bibliography

Access Economics (1991) *The Right Price*. Canberra.

Allen, B. T. (1975) Industrial Reciprocity: A Statistical Analysis. *The Journal of Law and Economics* 18, 507-520.

Allison, J. R. (1981) The Antitrust Implications of Barter. *Chicago-Kent Law Review* 58, 89-106.

American Oil Company v. McMullin. 508 F.2d 1345 (1975).

Ampol Ltd v. Caltex Oil (Australia) Pty Ltd (1986) 60 ALJR 225.

Anderson, J. F. (1967) Reciprocal Dealing. *The Yale Law Journal* 76, 1020-1029.

Anderson, R. W. and Johnson, R. N. (1999) Antitrust and Sales-Below-Cost Laws: The Case of Retail Gasoline. *Review of Industrial Organisation* 14, 189-204.

Asia Pulse Wire Service (2002) Caltex Australia Says No Price Fixing in Petrol Prices in Urban Areas. 2 May 2002.

Atkins, F. J. and Tayyebi Jazayeri, S. M. (2004) *A Literature Review of Demand Studies in World Oil Markets*. Department of Economics, University of Calgary.

Australian Associated Press News Wire (2000) Fuel shortage could halt petrol price cuts. 15 December.

Australian Associated Press News Wire (2001) Fed – Public right to be angry at petrol price rises says Howard. 27 April 2001.

Australian Associated Press Financial News Wire (2002) Crean rejects industry's cry poor claims. 27 April 2002.

Australian Automobile Association. Issues for Motorists: Petrol Prices. http://www.aaa.asn.au/issues/petrol.htm [Accessed 15 March 2007]

Australian Bureau of Agricultural and Resource Economics (2005) *Australian Commodity Statistics 2005*. Canberra.

Australian Bureau of Agricultural and Resource Economics (2006) *Australian Commodity Statistics 2006*. Canberra.

Australian Bureau of Statistics (2003) *Motor Vehicle Census: 31 March 2003*. Cat. no. 9309.0, Canberra.

Australian Bureau of Statistics (2005) *Information Paper: Introduction of the 15th Series Australian Consumer Price Index 2005 (Reissue)*. Cat. no. 6462.0, Canberra.

Australian Bureau of Statistics (2007) *Australian Demographic Statistics, September 2006*. Cat no. 3101.0, Canberra. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Sep%202006?OpenDocument [Accessed 30 March 2007]

Australian Bureau of Statistics (2007) *Australian National Accounts: National Income, Expenditure, and Product, December 2006*. Cat. no. 5206.0, Canberra.http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5206.0Dec%202006? OpenDocument [Accessed 11 March 2007]

Australian Bureau of Statistics (2007) *Consumer Price Index, Australia, December 2006*. Cat. no. 6401.0, Canberra. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Dec%202006?OpenDocument [Accessed 11 March 2007]

Australian Competition and Consumer Commission (1996) ACCC recommends end to petrol declaration when competitive forces re-structure fuel industry. *Media Release*, 15 August.

Australian Competition and Consumer Commission (1996) *Inquiry into the Petroleum Products Declaration*. Vol. 1, Main Report, AGPS, Canberra.

Australian Competition and Consumer Commission (1996) *Inquiry into the Petroleum Products Declaration*, Vol. 2, Appendixes, AGPS, Canberra.

Australian Competition and Consumer Commission (1999) Shell/Mobil Joint Refining Venture. *Media Release*, 21 January.

Australian Competition and Consumer Commission (2000) ACCC continues to monitor petrol prices. *Media Release*, 21 December.

Australian Competition and Consumer Commission (2000) *Report on the Movement in Fuel Prices in the September Quarter 2000*. Canberra.

Australian Competition and Consumer Commission (2001) *Reducing Fuel Variability: Discussion Paper*. Canberra.

Australian Competition and Consumer Commission (2001) *Reducing Fuel Price Variability*. Canberra.

Australian Competition and Consumer Commission (2002) *Terminal gate pricing arrangements in Australia and other fuel pricing arrangements in Western Australia*. Canberra.

Australian Competition and Consumer Commission (2003) ACCC finalises oil companies investigation. *Media Release*, 28 March.

Australian Competition and Consumer Commission (2003) *Summary of the Trade Practices Act 1974 – and additional responsibilities of the Australian Competition and Consumer Commission under other legislation*. Seventh Edition, Canberra.

Australian Competition and Consumer Commission (2004) *Assessing shopper docket petrol discounts and acquisitions in the petrol and grocery sectors*. Canberra.

Australian Competition and Consumer Commission (2004) No ACCC action over Vopak Port Botany lease. *Media Release*, 24 August.

Australian Competition and Consumer Commission (2005) *Understanding petrol prices in Australia: Answers to some frequently asked questions*. Canberra.

Australian Competition and Consumer Commission (2005) Federal Court orders $23.3 million in penalties for petrol price-fixing. *Media Release*, 17 March.

Australian Competition and Consumer Commission (2006) High Court dismisses ACCC – APCO special leave application. *Media Release*, 5 June.

Australian Competition and Consumer Commission (2006) Leahy Petroleum Pty Ltd & ors (Ballarat). *ACCC ejournal catalogue*, Canberra. http://www.www.accc.gov.au/content/index.phtml/itemId/586014 [Accessed 17 September 2007]

Australian Competition and Consumer Commission (2006) *Senate Economics Legislation Committee Inquiry into the price of petrol in Australia*. Canberra.

Australian Competition and Consumer Commission (2007) Petrol Pricing. *Media Release*, 24 January.

Australian Competition and Consumer Commission (2007) Geelong petrol decision 'disappointing'. *Media Release*, 29 May.

Australian Competition and Consumer Commission (2007) Leahy Petroleum Pty Ltd & others (Geelong). *ACCC ejournal catalogue*, Canberra. http://www.www.accc.gov.au/content/index.phtml/itemId/586014/fromItemId/684968 [Accessed 17 September 2007]

Australian Competition and Consumer Commission (2007) Transcript of Proceedings at Melbourne on Wednesday, 19 September 2007, at 1pm. Petrol Price Inquiry Hearing.

Australian Competition and Consumer Commission v Mobil Oil Australia and Ors (1997) ATPR ¶41-568.

Australian Institute of Petroleum (1997) Imported product and independent terminals fuel competition in Australia's retail petroleum market. *Petroleum Gazette* 32(1), 31-35.

Australian Institute of Petroleum (1998) *Oil and Australia Statistical Review 1997*. Melbourne.

Australian Institute of Petroleum (2002) *Review of the Trade Practices Act: Submission by the Australian Institute of Petroleum*. Canberra.

Australian Institute of Petroleum (2003) *Downstream Petroleum 2003*. Canberra.

Australian Institute of Petroleum (2006) Oil companies wholesale margins have not increased – CAV report flawed. *Media Release*, 25 July 2006.

Australia Institute of Petroleum (2006) *Submission to the Inquiry into Future Oil Supply and Alternate Transport Fuels*. Canberra.

Australian Institute of Petroleum (2006) *Submission to the Inquiry into the Price of Petrol in Australia*. Canberra.

Australian Petroleum Agents and Distributors Association. Membership Profile. http://www.apada.com.au/index.html [Accessed 26 March 2006]

Australian Service Station & Convenience Store News (1999) Deregulation Conference – Key players air their differences. March/April 1999: 16-19.

Areeda, P. E., Hovenkamp, H. and Elhauge, E. (1996) *Antitrust Law: An Analysis of Antitrust Principles and Their Application: Volume X*. Little, Brown and Company, Boston.

Ayres, I. (1987) How Cartels Punish: A Structural theory of Self-Enforcing Collusion. *Columbia Law Review* 87, 295-324.

Bain, J. S. (1949) A Note on Pricing in Monopoly and Oligopoly. *The American Economic Review* 39, 448-464.

Bain, J. S. (1956) *Barriers to New Competition*. Harvard University Press, Cambridge, Massachusetts.

Baker, D. I. and Blumenthal, W. (1983) The 1982 Guidelines and Preexisting Law. *California Law Review* 71, 311-347.

Baker, J. B. (1993) Two Sherman Act section 1 dilemmas: parallel pricing, the oligopoly problem, and contemporary economic theory. *The Antitrust Bulletin* 38, 143-219.

Baker, J. B. (1999) Policy Watch: Developments in Antitrust Economics. *The Journal of Economic Perspectives* 13, 181-194.

Barron, J. M., Loewenstein, M. A. and Umbeck, J. R. (1985) Predatory Pricing: The Case of the Retail Gasoline Market. *Contemporary Policy Issues* 3, 131-139.

Barron, J. M. and Umbeck, J. R. (1984) The Effects of Different Contractual Arrangements: The Case of Retail Gasoline Markets. *Journal of Law and Economics* 27, 313-328.

Barry, N. P. (1985) In Defense of the Invisible Hand. *Cato Journal* 5, 133-148.

Bernheim, B. D. and Whinston, M. D. (1990) Multimarket contact and collusive behaviour. *The Rand Journal of Economics* 21, 1-26.

Bertrand, J. (1883) Review of 'Theorie mathematique de la richesse social' and 'Recherches sur les principes mathematiques de la theorie des richesses. *Journal des Savants* 67, 499-508, English Translation by James W. Friedman reprinted in Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterization and Applications*. Cambridge University Press, Cambridge, 73-81.

Bertrand, R. J. (1981) *The State of Competition in The Canadian Petroleum Industry, Volume V – The Refining Sector.* Canadian Government Publishing Service, Hull, Quebec.

Blair, R. D. (1973) Reciprocity and Competition: A Problem of Conflicting 'Assumptions'. *Antitrust Law & Economics Review* 6, 77-86.

Blake, H. M. (1973) Conglomerate Mergers and the Antitrust Laws. *Columbia Law Review* 73, 555-592.

Blass, A. A. and Carlton, D. W. (2001) The Choice of Organisational Form in Gasoline Retailing and the Cost of Laws that Limit that Choice. *Journal of Law and Economics* XLIV, 511-524.

Blue Bell Co. v. Frontier Refining Co. 213 F.2d 354 (10th Cir. 1954).

Bollerslev, T., Engle, R. F., and Nelson, D. B. (1994) ARCH Models. In Engle, R. F. and McFadden, D. L. (eds.) *Handbook of Econometrics: Volume 4.* Elsevier Science Publishers B. V., Amsterdam, 2959-3038.

Bollerslev, T. and Wooldridge, J. M. (1992) Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time-Varying Covariances. *Econometric Reviews* 11, 143-172.

Borenstein, S. (1991) Selling Costs and Switching Costs: Explaining Retail Gasoline Margins. *The RAND Journal of Economics* 22, 354-369.

Borenstein, S. and Bushnell, J. (2005) *Retail Policies and Competition in the Gasoline Industry*. Center for the Study of Energy Markets Working Paper 114, University of California Energy Institute, Berkeley.

Borenstein, S. and Shepard, A. (1996) Dynamic Pricing in Retail Gasoline Markets. *The RAND Journal of Economics* 27, 428-451.

Bork, R. (1954) Vertical Integration and the Sherman Act: The Legal History of an Economic Misconception. *University of Chicago Law Review* 22, 157-201.

Bork, R. H. (1970) Antitrust in Dubious Battle. *St John's Law Review* 44, 663-676.

Bowley, A. L. (1924) *The Mathematical Groundwork of Economics*, Clarendon Press, Oxford.

Box, G. E. P., Jenkins, G. M., and Reinsel, G. (1994) *Time Series Analysis: Forecasting and Control*. Third Edition, Prentice Hall, Englewood Cliffs, New Jersey.

Box, G. E. P. and Tiao, G. C. (1975) Intervention Analysis with Applications to Economic and Environmental Problems. *Journal of the American Statistical Association* 70 No. 349, 70-79.

BP Australia Pty Ltd (2002) *Submission to the Review of the Provisions of the Trade Practices Act 1974 by BP Australia Pty Ltd*. Melbourne.

BP Australia Ltd (2005) Retail Pricing May 12 2005. http://www.bp.com.au /conveniences_stores/pricing.asp [Accessed 1 July 2005]

BP Australia Pty Ltd (2006) *Submission by BP Australia Pty Ltd on the Price of Petrol in Australia to Senate Economics Legislation Committee*. Melbourne.

BP Australia Pty Ltd (2007) *Submission by BP Australia Pty Ltd to the ACCC inquiry into the price of unleaded petrol*. Melbourne.

Business Review Weekly (2005) Big two fuelled for the next lap. 24 February: 48.

Bracks, S. (2000) Bracks Government Slams Howard over Crisis Facing Owner Drivers. *Media Release*, Premier of Victoria, 26 September.

Byers, D. W. (2003) Letter to the Editor. *The Advertiser*, Public Affairs Manager, Mobil Oil Australia, 14 August: 17.

Caltex Australia Limited (2002) *Submission to review of the competition provision of the Trade Practices Act.* Sydney.

Caltex Australia Limited (2005) *Caltex submission to Queensland Parliament: Impact of Petrol Pricing Select Committee.* Sydney.

Caltex Australia Limited (2006) *Caltex submission to Senate Economics Legislation Committee Inquiry into the Price of Petrol in Australia.* Sydney.

Caltex Australia Limited (2007) *Caltex submission to the ACCC inquiry into the price of unleaded petrol.* Sydney.

Caltex Oil Australia Pty Ltd (2005) Petrol pricing – the plain facts June 2005. http://www.caltex.com.au/pricing_pla.asp [Accessed 1 July 2005]

Cameron, R. (1998) What 'Battlers' Have to Say about Fuel Prices and Taxes. *Motoring Directions* 4(2), 9-12.

Campbell, I. (2004) Cleaner fuels, cleaner air and a healthier Australia. *Media Release*, Australian Minister for the Environment and Heritage, 22 July.

Campbell, I. (2005) Massive Investment in clean diesel for WA. *Media Release*, Australian Minister for the Environment and Heritage, 2 September.

Cavanagh, E. D. (2001) Reciprocal Dealing: A Rebirth? *St Johns Law Review* 75, 633- 648.

Castanias, R. and Johnson, H. (1993) Gar Wars: Retail Price Fluctuations. *The Review of Economics and Statistics* 75, 171-174.

Chamberlin, E. H. (1948) *The Theory of Monopolistic Competition.* Sixth Edition, Harvard University Press, Cambridge, Massachusetts.

Chamberlin, E. H. (1957) On the Origin of "Oligopoly". *The Economic Journal* 67, 211-218.

Chemical Week (1997) Shift Accelerates to Integrated Logistics. Vol. 159(21).

Chou, R. Y. (1988) Volatility Persistence and Stock Valuations: Some Empirical Evidence Using Garch. *Journal of Applied Econometrics* 3, 279-294.

Church, J. and Ware, R. (2000) *Industrial Organization: A Strategic Approach.* Irwin McGraw-Hill, Boston.

Clarke-Smith, J. M. (2002) The Development of Monopolistic Leveraging Theory and its Appropriate Role in Antitrust Law. *Catholic University Law Review* 52, 179-205.

Coase, R. H. (1935) The Problem of Duopoly Reconsidered. *The Review of Economic Studies* 2, 137-143.

Commonwealth of Australia (2001) *2001-02 Budget Paper No.1: Budget Strategy and Outlook 2001-02*. AusInfo, Canberra.

Commonwealth Treasury (2002) *Treasury Submission to the Fuel Taxation Inquiry*. Canberra.

Commonwealth Treasury (2006) *Australian Treasury Submission to the Inquiry into the Price of Petrol in Australia*. Canberra.

Competition Tribunal, Republic of South Africa (2003) *In the large merger between: Sasol Oil (Pty) Ltd and Excel Petroleum (Pty) Ltd*. Pretoria.

Consumer Affairs Victoria (2003) *Report on Terminal Gate Pricing in Victoria*. Melbourne.

Consumer Affairs Victoria (2006) *Report on Automotive Fuel Prices in Victoria: January 2003 to April 2006*. Melbourne.

Cooper, J. C. B. (2003) Price elasticity of demand for crude oil: estimates for 23 countries. *OPEC Review* March 2003, 1-8.

Costello, P. and Moore, J. (1998) Petroleum Marketing Reforms. *Media Release*, Joint Statement by the Australian Government Treasurer and the Minister for Industry, Science and Tourism, 20 July.

Cournot, A. (1838) *Research into the Mathematical Principles of the Theory of Wealth*. Translated by Nathaniel T. Bacon, The Macmillan Company, New York.

Court, R. (1999) Details of new fuel specification standards for Perth outlined. *Media Release*, Western Australian Premier, Minister for Public Sector Managements, and Federal Affairs, 2 August.

Crane, D. A. (2006) The Perverse Effects of Predatory Pricing Law. *Regulation* Winter 2005/2006, 26-31.

Dahl, C. (1986) Gasoline Demand Survey. *The Energy Journal* 7, 67-82.

Dahl, C. and Sterner, T. (1991) Analysing gasoline demand elasticities: a survey. *Energy Economics* 13, 203-210.

Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterisation and Applications*. Cambridge University Press, Cambridge.

Dawson, D., Segal, J. and Rendall, C. (2003) *Review of the Competition Provisions of the Trade Practices Act*. Canberra.

Dean, J. (1963) Economic Aspects of Reciprocity, Competition and Mergers. *The Antitrust Bulletin* VIII, 843-852.

De Bornier, J. M. (1992) The "Cournot-Bertrand Debate": A Historical Perspective. *History of Political Economy* 24, 623-656.

Delpachitra, S. and Beal, D. (2002) Petrol Prices Disparity: Did the Removal of Price Surveillance Create Price Competition? *Economic Papers* 21, 56-65.

Delpachitra, S. B. (2002) Price rigidity in the downstream petroleum industry in New Zealand: where does it happen? *Energy Economics* 24, 597-613.

Demsetz, H. (1992) How Many Cheers for Antitrust's 100 Years? *Economic Inquiry* 30, 207-217.

Department of the Environment and Heritage (2000) *National Fuel Quality Standards: Regulation Impact Statement*. Canberra.

Department of Industry, Science, and Resources (1999) *Downstream Petroleum Products Action Agenda*. Canberra.

Department of Industry, Tourism, and Resources (2002) *Downstream Petroleum Industry Framework 2002*. Canberra.

Department of Industry, Tourism and Resources (2002) *User Guide to the Petroleum Retail Marketing Sites Act 1980*. Canberra.

Department of Industry, Tourism and Resources (2006) *Australian Petroleum Statistics*. Canberra.

DeSanti, S. and Nagata, E. (1994) Competitor Communications: Facilitating Practices or Invitations to Collude? An Application of Theories to Proposed Horizontal Agreements Submitted for Antitrust Review. *Antitrust Law Journal* 63, 93-132.

Dixit, A. (1982) Recent Developments in Oligopoly Theory. *The American Economic Review* 72, 12-17.

Donnelly, W. A. (1982) The Regional Demand for Petrol in Australia. *The Economic Record* 58, 317-327.

Donnem, R. W. (1969) The Antitrust Attack on Reciprocity and Reciprocity Effect. *Antitrust Law Journal* 38, 637-651.

Eaton, B. C. and Lipsey, R. G. (1981) Capital, Commitment, and Entry Equilibrium. *The Bell Journal of Economics* 12, 593-604.

Eckert, A. (2003) Retail price cycles and the presence of small firms. *International Journal of Industrial Organization* 21, 151-171.

Eckert, A. and West, D. S. (2005) Price uniformity and competition in a retail gasoline market. *Journal of Economic Behaviour & Organization* 56, 219-237.

Edgeworth, F. Y. (1911) Contributions to the Theory of Railway Rates. *The Economic Journal* 21, 346-370.

Edgeworth, F. Y. (1897) The Pure Theory of Monopoly. *Giornale degli Economisti*, reprinted in Edgeworth, F. Y. (1925) *Papers Relating to Political Economy*. Macmillan and Co. Limited, London, 111-142.

Enders, W. (2004) *Applied Econometric Time Series*. Second Edition, Wiley, Hoboken.

Energy Information Administration, United States Department of Energy (2005) *Singapore Country Analysis Brief*. Washington DC. http://www.eia.doe.gov/emeu/cabs/singapor.html [Accessed 16 February 2006]

Engle, R. (2001) GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics. *The Journal of Economic Perspectives* 15, 157-168.

Engle, R. F. and Bollerslev, T. (1986) Modelling the Persistence of Conditional Variances. *Econometric Reviews* 5, 1-50.

Engle, R. F. and Granger, C. W. J. (1987) Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* 55, 251-276.

European Chemical News (2001) Vopak sells US, Australian non-core companies. 30 July: 15.

Ernst & Young (2001) *Downstream Oil Industry Financial Survey January 1997 – December 2001*. Canberra.

Espey, M. (1998) Gasoline demand revisited: an international meta-analysis of elasticities. *Energy Economics* 20, 273-295.

Evans, I. (2001) Clean Fuel Policy Starts Today. *Media Release*, South Australian Environment Minister, 1 March.

ExxonMobil Australia Pty Ltd (2002) *Submission to the Review of the Competition Provisions of the Trade Practices Act 1974*. Melbourne.

ExxonMobil Australia Pty Ltd. Facts on Petrol Pricing. http://www.exxonmobil.com.au/mobil/mn_mobil_products_automotive_facts.asp [Accessed 13 February 2006]

ExxonMobil Australia Pty Ltd (2004) *Submission to the Productivity Commission Inquiry into National Competition Policy*. Melbourne.

Federal Trade Commission (1967) Opinion of the Commission, 15 November, 1962, Consolidated Foods Corp. *Federal Trade Commission Decisions: Findings, Opinions, and Orders January 1, 1963, to June 30, 1963* 62, US Government Printing Office, Washington DC, p. 952.

Federal Trade Commission Docket No. 8934 (1973).

Federal Trade Commission (1999) *Statement of Chairman Robert Pitofsky and Commissioners Sheila F. Anthony and Mozelle W. Thompson, BP / Amoco, Docket No. C-3868*. Washington DC, 15 January.

Federal Trade Commission (2001) *Final Report of the Federal Trade Commission Midwest Gasoline Price Investigation*. Washington DC.

Federal Trade Commission (2002) *Letter to the Honourable Robert F. McDonnell, Commonwealth of Virginia, House of Delegates, Richmond, VA, by the Bureau of Competition and the Office of Planning*. Washington DC, 15 February.

Fellner, W. (1949) *Competition Among the Few*. Alfred A. Knoff, New York.

Fels, A. (1998) Competition Not Regulation is in Consumers' Best Interests. *Motoring Directions* 4(2), 16-22.

Fels, A. (2002) *The Review of the Trade Practices Act and issues concerning the ACCC and the media*. Speech to the National Press Club, Canberra, 31 July.

Fels, A. (2003) *Competition Policy: A Report Card for the last 12 years and an Agenda for the Future*. Speech to the National Press Club, Canberra, 30 June.

Ferguson, J. M. (1965) Tying Arrangements and Reciprocity: An Economic Analysis. *Law and Contemporary Problems* 30, 532-580.

Finney, F. R. (1969) Reciprocity and Public Policy. *Antitrust Law and Economic Review* 2, 97-110.

Fisher, I. (1898) Cournot and Mathematical Economics. *The Quarterly Journal of Economics* 12, 119-138.

Fisher, I. (1938) Cournot Forty Years Ago. *Econometrica* 6, 198-202.

Fisher, F. M. (1989) Games Economists Play: A Non-co-operative View. *The RAND Journal of Economics* 20, 113-124.

Fitzgibbon, J. (2006) Howard and Costello At Odds Over Petrol Prices. *Media Release*, Shadow Assistant Treasurer, 22 August.

Flaim, T. (1979) The Structure of the U.S. Petroleum Industry: Joint Activities and Affiliations, *The Antitrust Bulletin* 24, 555-572.

Foodweek (2000) 7-Eleven in rapid-fire expansion. 21 February.

Fox, K. MOPS 95 – The Benchmark for Australian Grade Unleaded Motor Spirit. http://www.aip.com.au/industry/benchmark.htm. [Accessed 15 November 2005]

Fuel Taxation Inquiry (2001) *Issues Paper*. Commonwealth Treasury, Canberra.

Freudenrich, C. C. How Oil Refining Works. http://science.howstuffworks.com /oil-refining.htm/printable [Accessed 25 January 2006]

Friedman, J. W. (1971) A non-co-operative equilibrium for supergames. *Review of Economic Studies* 38, 1-12, reprinted in Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterization and Applications*. Cambridge University Press, Cambridge, 142-157.

Friedman, J. (1983) *Oligopoly Theory*. Cambridge University Press, New York.

Friedman, M. (1987) Letter to the Editor. *The Wall Street Journal*, 24 June: 1.

Gabbitas, O. and Eldridge, D. (1998) *Directions for State Tax Reform*. Productivity Commission Staff Research Paper, AusInfo.

Gerber, P. (1986) Contract – General rules of interpretation – Commercial and business transactions – Exchange by producers of oil refinery products – "Non-like products". *The Australian Law Journal* 60, 577-579.

Geroski, P. A., Philps, L. and Ulph, A. (1985) Oligopoly, Competition and Welfare: Some Recent Developments. *The Journal of Industrial Economics* 33, 369-386.

Government of Western Australia (2004) *Final Progress Report: Implementing National Competition Policy in Western Australia*. Perth.

Gujarati, D. N. (1995) *Basic Econometrics*. Third Edition, McGraw-Hill, New York.

Gull Petroleum. Western Australian Country Sites. http://www.gullpetroleum.com.au/ [Accessed 22 February 2006]

Gull Petroleum. Western Australian Metro Sites. http://www.gullpetroleum.com.au/ [Accessed 22 February 2006]

Grace, J. G. (1991) An Overview of Legislation Controlling the Retailing of Petroleum within Australia. *Australian Business Law Review* 19, 391-403.

Grace, J. G. (1992) An Overview of Legislation Controlling the Retailing of Petroleum Within Australia: Part II. *Australian Business Law Review* 20, 7-30.

Graham, D. J. and Glaister, S. (2002) The Demand for Automobile Fuel. *Journal of Transport Economics and Policy* 36, 1-26.

Granger, C. W. J. (1981) Some Properties of the Time Series Data and Their Use in Econometric Model Specification. *Journal of Econometrics* 16, 121-130.

Granger, C. W. J. (1986) Developments in the Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics* 48, 213-228.

Granger, C. W. J. and Newbold, P. (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2, 111-120.

Green, E. J. and Porter, R. H. (1984) Non-co-operative Collusion under Imperfect Price Information. *Econometrica* 50, 87-100.

Hale, G. E. and Hale, R. D. (1964) Reciprocity under the Antitrust Laws: A Comment. *University of Pennsylvania Law Review* 113, 69-76.

Handler, M (1963) Emerging Antitrust Issues: Reciprocity, Diversification and Joint Ventures. *Virginia Law Review* 49, 433-447.

Hastings, J. S. (2004) Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California. *The American Economic Review* 94, 317-328.

Hausman, R. M. (1964) Reciprocal Dealing and the Antitrust Laws. *Harvard Law Review* 77, 873-886.

Harris, P. C. (2002) Petrol Price Movements: One of the oil companies provides an explanation. *Motoring Directions* Issue 1 2002, 10-12.

Harsha E. H. (1963) The Conglomerate Merger and Reciprocity – Condemned by Conjecture? *Antitrust Bulletin* 9, 201-230.

Hart, O. and Tirole, J. (1990) Vertical Integration and Market Foreclosure. *Brookings Papers on Economic Activity*, Microeconomics (1990), 205-276.

Hawaii, Department of Attorney General (1994) *The Attorney General's 1994 Interim Report on the Investigation of Gasoline Prices*. Honolulu.

Herald Sun (1997) Dollar Blamed for Petrol Price Rise. 29 November 1997: 5.

Herald Sun (1997) RACV urges phone tap power. 22 December 1997: 22.

Herald Sun (2000) State's petrol flows again. 27 September 2000: 9.

Herald Sun (2003) Dockets drive cheaper petrol. 28 July: 18.

Herald Sun (2003) Pumped up for fuel wars. 28 July: 72.

Herald Sun (2003) Shoppers prime pump price war. 29 July: 13.

Hill, R. (2001) Hill Announces National Fuel Standards. *Media Release*, Australian Government Minister for the Environment and Heritage, 15 July.

Hilmer, F. G., Rayner, M. R. and Taperell, G. Q. (1993) *National Competition Policy: Report by the Independent Committee of Inquiry*. AGPS, Canberra.

Hotelling, H. (1929) Stability in Competition. *The Economic Journal* 39, 41-57.

House of Assembly Select Committee on Petrol, Diesel, and LPG Pricing (2001) *Official Hansard Report*. Monday 28 May 2001 at 4.25pm, Parliament of South Australia, Adelaide.

House of Assembly Select Committee on Petrol, Diesel, and LPG Pricing (2001) *Interim Report*. Parliament of South Australia, Adelaide.

Hurwics, L. (1953) What Has Happened to the Theory of Games. *The American Economic Review* 43, 398-405.

Impact of Petrol Pricing Select Committee (2005) Transcript of Proceedings at Yeronga on Monday, 28 November 2005, at 9.31am. Queensland Parliament, Brisbane.

Independent Competition and Regulatory Commission (2001) *Final Report: Inquiry into Motor Vehicle Fuel Prices*. Canberra.

Independent Petroleum Marketers Association of Australia (2001) *Response to Australian Competition & Consumer Commission Reducing Fuel Variability Discussion Paper*. Melbourne.

Independent Petroleum Marketers Association of Australia (2002) *Submission to the Senate Legal and Constitutional Reference Committee for the Committee's Inquiry into the Trade Practices Act 1974*. Melbourne.

Industry Commission (1994) Petroleum Products. AGPS, Melbourne, Report No.40.

Industry Commission (1996) *State, Territory and Local Government Assistance to Industry*. AGPS, Melbourne, Report No.55.

Joskow, J. L. and Rose, N. L. (1989) The Effects of Economic Regulation. In Schmalensee, R. and Willig, R. D. (eds.) *Handbook of Industrial Organization*. Vol. II, Elsevier Science Publishers B. V., Amsterdam, 1449-1506.

Kaplow, L. (1985) Extension of Monopoly Power Through Leverage. *Columbia Law Review* 85, 515-556.

Kaysen, C. (1951) Collusion Under the Sherman Act 1. *The Quarterly Journal of Economics* 65, 263-270.

Kenkel, J. L. (1995) *Introductory Statistics for Management and Economics*. Fourth Edition, Duxbury Press, Belmont.

Kennett, J. (1997) Petrol and Diesel Tax Cuts Take Effect Sunday. *Media Release*, Premier of Victoria, 29 May.

Kennett, J. (1997) Premier Announces $106 Million Cut in Petrol Taxes. *Media Release*, Premier of Victoria, 27 April.

Klein, B., Crawford, R. G. and Alchian, A. A. (1978) Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *Journal of Law and Economics* 21, 297-326.

Lateline (1999) Fels faces foe. ABC Television, 9 May.

Laurent, S. and Peters, J. (2002) G@RCH: An OX Package for Estimating and Forecasting Various ARCH Models. *Journal of Economic Survey* 16, 447-485.

Legislative Assembly of Queensland (2006) *Inquiry into Petrol pricing in Queensland*. Queensland Parliament, Brisbane.

Lerner, A. P. (1934) The Concept of Monopoly and the Measurement of Monopoly Power. *The Review of Economic Studies* 1, 157-175.

Ljung, G. M. and Box, G. E. P. (1978) On Measure of Lack of Fit in Time Series Models. *Biometrika* 65, 297-303.

Lorie, J. H. and Halpern, P. (1970) Conglomerates: The Rhetoric and the Evidence. *Journal of Law and Economics* 13, 149-166.

Lowe, J. F. (1976) Competition in the U.K. Retail Petrol Market 1960-73. *The Journal of Industrial Economics* XXIV, 203-219, p. 204.

Macfarlane, I. (2006) Oilcode to Deliver a Fairer Petrol Market. *Media Release*, 30 March.

McGee, J. S. (1958) Predatory Price Cutting: The Standard Oil (N.J.) Case. *Journal of Law and Economics* 1, 137-169.

McGee, J. S. (1988) *Industrial Organization*. Prentice Hall, Englewood Cliffs, New Jersey.

McGee, J. S. and Bassett, L. R. (1976) Vertical Integration Revisited. *Journal of Law and Economics* 19, 17-38.

McGimpsey, R. (1998) The Petroleum Industry's Distortions and Anomalies. *Motoring Directions* 4(2), 13-15.

Makridakis, S., Wheelwright, S. C. and Hyndman, R. J. (1998) *Forecasting: Methods and Applications*. Third Edition, John Wiley & Sons Inc, Hoboken.

Markham, J. W. (1951) The Nature and Significance of Price Leadership. *The American Economic Review* 41, 891-905.

Marschak, J. (1946) Neumann's and Morgenstern's New Approach to Static Economics. *The Journal of Political Economy* 54, 97-115.

Marvel, H. P. (1978) Competition and Price Levels in the Retail Gasoline Market. *The Review of Economics and Statistics* 60, 252-258.

Maskin, E. and Tirole, J. (1988) A Theory of Dynamic Oligopoly, II: Price Competition, Kinked Demand Curves, and Edgeworth Cycles. *Econometrica* 56, 571-599.

Matilda Fuel. History and Future. http://www.matildafuel.com.au/handf.asp [Accessed 22 February 2006]

Mick Skorpos Petrol Discount King Pty Ltd v The Shell Company of Australia Limited (1997) No SG 96 of 1995, FED No. 53/97, Practice and Procedure – pleading, 19 February.

Mills, T. C. (1990) *Time series techniques for economists*. Cambridge University Press, Cambridge.

Miller, R. L. (1978) *Intermediate Microeconomics: Theory, Issues, and Applications*. McGraw-Hill Kogakusha, Tokyo.

Mobil Oil Australia Pty Ltd (2003) Adelaide Refinery. *Media Release*, 8 April 2003.

Modern Bulk Transporter (2001) Royal Vopak Sells Terminals in US, Australia. Vol. 64(2).

Monopolies and Mergers Commission (1990) *The Supply of Petrol: A Report on the supply in the United Kingdom of petrol by wholesale*. Her Majesty's Stationary Office, London.

Moore, H. L. (1906) Paradoxes of Competition. *The Quarterly Journal of Economics* 20, 211-203.

More, T. (1975) *Utopia: A New Translation Backgrounds Criticism*. Translated and Edited by Robert M. Adams, W. W. Norton & Company Inc, New York.

Motor Trades Association of Australia (2002) *Submission by the Motor Trades Association of Australia to the Review of the Trade Practices Act*. Canberra.

Motor Trades Association of Australia (2006) *Submission to the Senate Economics Legislation Committee Inquiry into the price of petrol in Australia*. Canberra.

Motor Trades Association of Australia (2007) MTAA Welcomes Moves to Examine Petrol Pricing. *Media Release*, 15 June.

Mueller, W. F. (1971) The Rising Economic Concentration in America: Reciprocity, Conglomeration, and the New American 'Zaibatsu' System (II). *Antitrust Law & Economic Review* 4, 91-104.

Nalebuff, B. (2003) *Bundling, Tying, and Portfolio Effects: Part 1 – Conceptual Issues*. DTI Economics Paper No. 1, London.

Nash, J. (1951) Non-Co-operative Games. *Annals of Mathematics* 54, 286-95, reprinted in Daughety, A. F. (ed.) (1988) *Cournot Oligopoly: Characterization and Applications*. Cambridge University Press, Cambridge, 82-99.

National Competition Council (2001) *2001 NCP assessment*. Melbourne.

National Competition Council (2005) *Assessment of governments' progress in implementing the National Competition Policy and related reforms*. Melbourne.

National Road Motorists Association (2003) Petrol prices return to pre-war levels. *Media release*, 7 May.

Neumann Petroleum. Welcome to Neumann Petroleum. http://www.neumannpetroleum.com.au/ [Accessed 22 February 2006]

Newey, W. K. and West, K. D. (1987) Hypothesis Testing with Efficient Method of Moments Estimation. *International Economic Review* 28, 777-787.

New South Wales Government (2001) *New South Wales Government Submission to the Commonwealth Government's Inquiry into Fuel Taxation.* Sydney.

Nichol, A. J. (1934) A Re-Appraisal of Cournot's Theory of Duopoly Price. *The Journal of Political Economy* 42, 80-105.

Norman, H. (2001) Exchange Agreements Facilitate Collusion. *German Economic Review* 2, 113-125.

Oil & Gas Journal (2000) Industry Briefs. 17 January: 27.

Office of State Revenue, New South Wales Treasury (2003) *Petroleum Products Scheme – Northern NSW.* Sydney.

Pallas, T. (2007) $178M Cuts for Victorian Motorists. *Media Release,* Victorian Government Minister for Roads and Ports, 27 April.

Peltzman, S. (1969) Issues in Vertical Integration Policy. In Weston, J. F. and Peltzman, S. (eds.) (1969) *Public Policy Toward Mergers.* Goodyear Publishing Company, Pacific Palisades, 167-176.

Perron, P. (1990) Testing for a Unit Root in a Time Series with a Changing Mean. *Journal of Business & Statistics* 8, 153-162.

Perron, P. (1989) The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. *Econometrica* 57, 1361-1401.

Petroleum Products Retail Outlets Board of South Australia. Information. http://wwwsafework.sa.gov.au/uploaded_files/pprob.pdf [Accessed 22 February 2006]

Pigou, A. C. (1929) *The Economics of Welfare.* Third Edition, Macmillan, London.

Platts Commodity News (2001) BP Australia to terminate refinery exchange July 2002. 30 November: 22.

Platts Commodity News (2003) Australia's gasoline imports to trade at premium due to new specs. 8 December.

Platts Oilgram News (2000) Mobil Australia to Slice Runs After Swaps Dispute. 3 January: 1.

Platts Oilgram News (2001) BP Roils Australia's Fuel Exchange Program. 9 November: 1.

Platts Oilgram News (2001) BP Maps End of Australian Fuel Swaps: Wants rivals to buy 20-30% of product at Jan 1. 3 December: 2.

PM Program (2000) Petrol Blockade. ABC Radio, 25 September.

PM Program (2000) Petrol prices remain high over Christmas. ABC Radio, 22 December.

Posner, R. A. (1970) Conglomerate Mergers and Antitrust Policy: An Introduction. *St John's Law Review* 44, 529-532.

Posner, R. (1976) *Antitrust Law: An Economic Approach*. The University of Chicago Press, Chicago.

Primary Industries and Resources South Australia (1999) *PIRSA Annual Report 1998-99*. Adelaide.

Productivity Commission (2001) Transcript of Proceedings at Melbourne on Friday, 8 June 2001, at 9.30am. Draft Report on the Prices Surveillance Act.

Productivity Commission (2001) *Review of the Prices Surveillance Act 1983*. Report no. 14, AusInfo, Canberra.

Quantitative Micro Software (2007) *Eviews 6.0 Users Guide*. Irvine.

United Petroleum. About United Petroleum. http://www.unitedpetroleum.com.au/about-united [Accessed 22 February 2006]

Regulation Taskforce (2006) *Rethinking Regulation: Report of the Taskforce on Reducing Regulatory Burdens on Business*. Report to the Prime Minister and the Treasurer, Canberra, January.

Renfrew, C. B. (1993) Intercompetitor Co-operation in the Petroleum Industry. *Antitrust Law Journal* 61, 559-577.

Restrictive Trade Practices Commission (1986) *Competition in the Canadian Petroleum Industry*. Canadian Government Publishing Centre, Supply and Services Canada, Ottawa.

Retail World (2000) Burmah's market exit strengthens 7-Eleven. 15 May: 4.

Retail World (2000) 7-Eleven heading to 250 c-stores. 28 August: 28.

Reuters Wire Service (1996) High Australian gasoline stocks push cargoes north. 4 August.

Reuters Wire Service (2000) Diary – Asian Oil Refinery Maintenance 2000. 28 June.

Reuters Wire Service (2000) Shell Australia Clyde refinery report due in March. 15 March.

Reuters Wire Service (2000) Mobil Australia says new fuels help refinery. 23 October.

Ritchie, S. (1976) Petroleum Dismemberment. *Vanderbilt Law Review* 29, 1131-1165.

Roarity, M. (2004) *Petrol pricing in Australia: issues and trends*. Department of Parliamentary Services, Canberra.

Rose, J. (1999) The ACCC and the Market Power of the Oil Majors – Part 1. *Trade Practices Law Journal* 7, 17-30.

Rose, J. (1999) The ACCC and the Market Power of the Oil Majors – Part 2. *Trade Practices Law Journal* 7, 74-87.

Rotemberg, J. J. and Saloner, G. (1986) A Supergame-Theoretic Model of Price Wars during Booms. *The American Economic Review* 76, 390-407.

Royal Commission on Petroleum (1976) *Fourth Report: The Marketing and Pricing of Petroleum Products in Australia*. AGPS, Canberra.

Royal Pakhoed and Van Ommeren (1998) Joint Media Release. *Media Release*, 2 March.

Rubicon Limited (2001) Sale of Brisbane Fuel Terminal / Return of Capital. *Australian Stock Exchange Company Announcements*, 12 June.

Rudd, K., Bowen, C. and Swan, W. (2007) Rudd Labor Government to Appoint Petrol Commissioner. *Media Release*, Joint Statement by the Leader of the Opposition, the Shadow Assistant Treasurer, Revenue and Competition Policy and Shadow Treasurer, 12 June.

Schelling, T. (1956) An Essay on Bargaining. *The American Economic Review* 46, 281-306.

Schelling, T. (1960) *The Strategy of Conflict*. Harvard University Press, Cambridge, Massachusetts.

Scherer, F. M. (1996) *Industry Structure, Strategy, and Public Policy*. HarperCollins College Publishers, New York.

Senate Economics Committee (2000) *Hansard*. Inquiry into the Provisions of the Fair Prices and Better Access for All (Petroleum) Bill 1999 and the Practice of Multi-Site Franchising by Oil Companies, 12 April, Canberra.

Senate Economics Committee (2001) *Inquiry into the provisions of the Fair Prices for All (Petroleum) Bill 1999 and the practice of multi-site franchising by oil companies*. Canberra.

Senate Standing Committee on Economics (2006) *Petrol Prices in Australia*. Canberra.

7-Eleven Stores Pty Ltd (2001) *Submission regarding Reducing Fuel Price Variability*. Melbourne.

7.30 Report (1999) Petrol Prices. ABC Television, 9 August.

Shepard, A. (1990) Pricing Behaviour and Vertical Contracts in Retail Markets. *The American Economic Review* 80, 427-431, p. 427.

Sichel, W. (1968) Business Reciprocity: An Unsettled Antitrust Issue. *Antitrust Bulletin* 13, 649-658.

Slade, M. E. (1992) Vancouver's Gasoline-Price Wars: An Empirical Exercise in Uncovering Supergame Strategies. *The Review of Economic Studies* 59, 257-276.

Smith, A. (1999) *An Inquiry into the Nature and Causes of the Wealth of Nations*. Penguin Books, London.

Smith, H. M. and Wilson, T. M. (1972) Reciprocity and the Private Plantiff. *Maryland Law Review* XXXII, 91-127.

Spears, J. L. (1992) Argument for and against Legislative Attacks on Downstream Vertical Integration in the Oil Industry. *Kentucky Law Journal* 80, 1075-1092.

Spengler, J. J. (1950) Vertical Integration and Antitrust Policy. *Journal of Political Economy* 58, 347-352.

Starkey, J. (1996) The Downstream Petroleum Industry – A Commentary. *[1996] AMPLA Yearbook*, 379-385.

Sterner, T. and Dahl, C. (1992) Modelling transport fuel demand. In Sterner, T, (ed) *International Energy Economics*. Chapman and Hall, London, 65-79.

Sterner, T., Dahl, C. and Franzen, M. (1992) Gasoline Tax Policy, Carbon Emissions and the Global Environment. *Journal of Transport Economics and Policy* 26, 109-119.

Stigler, G. J. (1940) Notes on the Theory of Duopoly. *The Journal of Political Economy* 48, 521-542.

Stigler, G. J. (1947) The Kinky Oligopoly Demand Curve and Rigid Prices. *The Journal of Political Economy* 55, 432-449.

Stigler, G. J. (1964) A Theory of Oligopoly. *The Journal of Political Economy* 72, 44-61.

Stigler, G. J. (1969) *Working Paper IV: Reciprocity: Report of the Task Force on Productivity and Competition.* Reprinted in *Antitrust Law and Economics Review* 2, 51-52.

Stigler, G. J. (Chairman of the Task Force) (1969) *Report of the Task Force on Productivity and Competition.* Reprinted in *Antitrust Law and Economics Review* 2, 30-31.

Stock, J. H. and Watson, M. W. (1988) Variable Trends in Economic Time Series. *The Journal of Economic Perspectives* 2, 147-174.

Stocking, G. W. and Mueller, W. F. (1957) Business Reciprocity and the Size of Firms. *The Journal of Business* 30, 73-95.

The Advertiser (1997) Newcomer may ignite petrol price war. 1 July 1997.

The Advertiser (1999) Stanvac rates 'a done deal'. 23 December: 32.

The Advertiser (2000) Stanvac refinery rates slashed. 4 March: 8.

The Advertiser (2000) Oil Change. 4 March: 61.

The Advertiser (2000) Port of Storms. 4 May: 19.

The Advertiser (2000) Refinery Rates decision near. 1 September: 2.

The Advertiser (2001) Clean fuel 'costing us 2c a litre. 10 March 2001: 13.

The Advertiser (2003) Closure comes after foreign rivals fall out: The History. 9 April: 2.

The Age (2000) Petrol Supplies Start to Dwindle. 26 September: 3.

The Age (2001) Oil Companies Are Profiteers: RACV. 1 January: 3.

The Age (2003) Fuels Duel Hits Small Business. 21 August: 12.

The Australian (1997) Judge blasts ACCC on petrol price-fix claims. 6 June: 4.

The Australian (1997) No collusion at petrol pumps. 6 June: 1.

The Australian (2000) Bracks douses truckies' fuel rage. 27 September: 28.

The Australian (2000) City petrol still on a high. 22 December 2000: 15.

The Australian (2000) PM tells oil chiefs – cut petrol prices. 30 December: 3

The Australian (2000) Shell, Caltex weigh refinery merger. 15 March 2000: 25.

The Australian (2000) Jobs will go but Shell refinery wins brief respite. 24 March: 23.

The Australian (2001) Shell jobs fear over clean fuel. 6 March: 7.

The Australian (2003) Woolies ties up Caltex deal. 22 August: 17.

The Australian Financial Review (1985) BP Begins Closure of Plant at Westernport. 31 January: 9.

The Australian Financial Review (1999) Government throws refiners a lifeline. 3 December: 58.

The Australian Financial Review (1999) Mobil to halve Port Stanvac Production. 30 December: 3.

The Australian Financial Review (2000) Shell Shock for Caltex on Reform Rollercoaster. 27 March: 23.

The Australian Financial Review (2001) The Slippery Politics of Oil. 2 June: 28.

The Australian Financial Review (2003) Coles Ready to Man the Pumps. 16 July: 43.

The Australian Financial Review (2003) Companies and Markets – Fuel shake-up may cost Woolies $16m. 30 June: 14.

The Australian Financial Review (2003) Supermarkets Try to Make Petrol a Happy Purchase. 23 August: 5.

The Courier Mail (1998) Govt fuel reform claims fires up independent. 22 July.

The Courier Mail (2001) Neumann pays $18m for Rubicon fuel depot. 12 June: 24.

The Daily Telegraph (1999) Inquiry into 10c petrol price rise. 5 August: 17.

The Daily Telegraph (2003) War of the hoses. 2 August: 97.

The Oil Daily (2000) Truckers Block Fuel Supplies. 27 September.

The Shell Company of Australia Limited (2000) Shell Clyde Refinery Future. *Media Release*, 23 March.

The Shell Company of Australia Limited (2000) Victorian Fuel Blockade – Shell. *Media Release*, 25 September.

The Shell Company of Australia Limited (2001) Petrol Prices Fall Except in South Australia. *Media Release*, 2 March.

The Shell Company of Australia Limited (2001) *Shell submission to the Review of the Prices Surveillance Act 1983*. Melbourne.

The Shell Company of Australia Limited (2001) Unique Fuel Quality Specifications Causes Higher Petrol Prices. *Media Release*, 31 December.

The Shell Company of Australia Limited (2002) *Submission to the Commission of Inquiry into the Trade Practices Act 1974*. Melbourne.

The Shell Company of Australia Limited (2005) What Drives Prices? http://www.shell.com.au/home/PrintFramework?siteId=au-en&FC3=/home/au-en/html/iwg [Accessed 1 July 2005]

The Shell Company of Australia Limited (2006) *Shell Australia's Submission to the Senate Economics Legislation Committee Inquiry into the Price of Petrol in Australia*. Melbourne.

The Royal Swedish Academy of Sciences (2003) The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2003 – Information for the Public: Statistical Methods for Economic Time Series. http://nobelprize.org/nobel_prizes/economics/laureates/2003/public.html. [Accessed 14 September 2006]

The Sydney Morning Herald (2002) NRMA Chief Suspicious of Patterned Rise in Petrol Prices. 25 April 2002: 4.

The West Australian (2001) WA Fuel Policies Hits Independents. 1 December: 41.

The West Australian (2004) Fuel firms blame State standards – Cheapest Unleaded Petrol 2003. 14 January.

Thomas v. Amerada Hess Corporation. 393 F.Supp. 58 (M.D. Pa. 1975).

Thompson, M. (2006) Federal Government Must Investigate Fuel Pricing. *Media Release*, Victorian Minister for Consumer Affairs, 20 June.

Trade Practices Commission (1995) Ampol Caltex Merger 'Likely to Breach Trade Practices Act'. *Media Release*, 2 February.

Trade Practices Commission v Service Station Association Ltd and Others (1992) 109 ALR 465.

Valadkhani, A. and Layton, A. P. (2004) Quantifying the Effect of the GST on Inflation in Australia's Capital Cities: An Intervention Analysis. *The Australian Economic Review* 37, 125-138.

Vita, M. G. (2000) Regulatory Restrictions on Vertical Integration and Control: The Competitive Impact of Gasoline Divorcement Policies. *Journal of Regulatory Economics* 18, 217-233.

Walker, J. and Woodward, L. (1996) The Ampol /Caltex Australia Merger: Trade Practices Issues. *Trade Practices Law Journal* 4, March, 21-44.

Waller, S. W. (2000) Can U.S. antitrust laws open international markets? *Northwestern Journal of International Law & Business* 20, 207-232.

Walters, S. J. K. (1986) Reciprocity Reexamined: The Consolidated Foods Case. *Journal of Law & Economics* 29, 423-438.

Webb, R. (2000) *Petrol and Diesel Excises*. Department of the Parliamentary Library, Canberra.

Webb. R. (2001) *Fuel Price Subsidy Schemes*. Department of the Parliamentary Library, Canberra.

Webb, R. (2001) *Some Issues in Fuel Taxation*. Department of the Parliamentary Library, Canberra.

Welford, R. (2000) Boost For Air Quality From Government Fuel Initiative. *Media Release*, Queensland Environment and Heritage/Natural Resources Minister, 7 February.

Whinston, M. D. (1990) Tying, Foreclosure, and Exclusion. *The American Economic Review* 80, 837-859.

White, H. (1980) A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica* 48, 817-838.

Williamson, O. E. (1971) The Vertical Integration of Production: Market Failure Considerations. *The American Economic Review* 61, 112-123.

Williamson, O. E. (1983) Credible Commitments: Using Hostages to Support Exchange. *The American Economic Review* 73, 519-540.

Williamson, O. E. (1989) Transaction Cost Economics. In Schmalensee, R. and Willig, R. D. (eds.) *Handbook of Industrial Organisation: Volume 1*. Elsevier Science Publishers B. V., Amsterdam, 135-182.

Wooldridge, J. M. (2003) *Introductory Econometrics: A Modern Approach.* Thomson South-Western, Australia.

Woolworths Limited (2001) *Submission to Australian Competition and Consumer Commission on: Reducing Fuel Price Variability.* Sydney.

Woolworths Limited (2001) Woolworths Plus Petrol Leases 69 Liberty Oil Outlets. *Media Release* 6 July 2001.

Woolworth Limited (2002) Woolworths Plus Petrol and MTBE. http://www.woolworthlimited.com.au/news/factsheets/publicdocuments/18-01-2002_a [Accessed 14 February 2005]

Yamey, B. S. (1972) Predatory Price Cutting: Notes and Comments. *Journal of Law and Economics* 15, 129-142.